WESTERN BIRDS

Vol. 34, No. 1, 2003

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Western Specialty:
Mountain Bluebird

Photo by Tim Reeves of Farmington, New Mexico: Mountain Bluebird (*Sialia currucoides*), Farmington Lake, Farmington, New Mexico, 10 February 2000.

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Front cover photo by © William E. Grenfell of Granite Bay, California: Wood Sandpiper (*Tringa glareola*), Gambell, St. Lawrence Island, Alaska, 1 June 2001.

Back cover "Featured Photo" by © Robert W. Dickerman of Albuquerque, New Mexico: Scarlet Tanagers (*Piranga olivacea*), including specimen from Rio Rancho, New Mexico, January 2002.

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WESTERN BIRDS

Volume 34, Number 1, 2003

BREEDING STATUS AND HABITAT USE OF BLACK-NECKED STILTS AND AMERICAN AVOCETS IN SOUTH SAN FRANCISCO BAY

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ABSTRACT: In light of recent and proposed restoration projects that will affect bird numbers in San Francisco Bay, California, we assessed the status of breeding populations of the Black-necked Stilt (*Himantopus mexicanus*) and American Avocet (*Recurvirostra americana*) in South San Francisco Bay in May 2001. We counted 1184 stilts and 2765 avocets. Considering only birds observed exhibiting breeding behaviors, our low estimates of breeding birds in the south bay were 270 stilts and 880 avocets, but the true numbers are probably closer to the number of stilts and avocets we actually counted. Our estimates of the breeding population fall within the range of similar estimates from the south bay 20–30 years ago. We know of no other sites on the Pacific coast of the United States with breeding populations of stilts and avocets whose sizes approach those of the South San Francisco Bay. The greatest numbers of stilts and avocets bred on salt ponds in the south bay; lesser numbers bred in a combination of fresh and salt marshes. The observed use by stilts and avocets of available habitat differed significantly from expected use. Stilts used tidal marshes and salt ponds approximately in order of availability, whereas avocets made greater use of salt ponds. Within marshes, stilts most often used vegetated areas followed by mudflat/open water habitat, whereas for avocets the pattern was reversed. Within salt ponds, both species were most often observed on islands, but their order of use of other microhabitats in salt ponds differed. We observed little use of tidal flats by breeding stilts and avocets.

The San Francisco Bay estuary (hereafter, the bay) is recognized as a site of hemispheric importance to shorebirds (Harrington and Perry 1995) because it holds over 500,000 shorebirds (Page et al. 1999). Over 90% of the bay's wetlands, especially tidal marsh, have been filled or diked over the past 150 years to create agricultural lands and salt-evaporation ponds (Harvey et al. 1988, Goals Project 1999). Salt ponds now cover over 12,000 ha around San Francisco and San Pablo bays (Goals Project 1999), the majority being in South San Francisco Bay (hereafter, the south bay).

The presence of American Avocet bones in native American middens suggests that this species was in the bay prior to the first published report in 1884 (Grinnell et al. 1918, Howard 1929). The first breeding record was an observation of downy young in 1926 (Gill 1977), a year prior to Grinnell and Wythe's (1927) listing the bird as an irregularly common visitor to the bay. No additional documentation of breeding by avocets exists prior to Martin's (1939) discovery of young in Santa Clara County in 1937. By 1952, Sibley (1952) considered the species to be a common resident but listed only scattered breeding records for 1941 and 1950. In 1972, Gill (1972) estimated 1800 breeding pairs in the south bay. Subsequent studies by Moss (1980) and Rigney and Rigney (1981) estimated 800 and 650 breeding pairs, respectively.

Grinnell et al. (1918) noted that Black-necked Stilts appeared sparingly in the bay, and Grinnell and Wythe (1927) reported the first nesting there by this species. The Black-necked Stilt remained an uncommon summer resident and rare winter visitant in the south bay through the early 1950s (Sibley 1952). Numbers of nesting stilts increased over the next two decades with breeding populations in the south bay estimated at 400–500 pairs in 1971 (Gill 1972) and 600–650 pairs in 1981 (Rigney and Rigney 1981). The creation of salt ponds has been credited with increasing breeding and nonbreeding populations of Black-necked Stilts and American Avocets in the bay (Gill 1977, Harvey et al. 1988), providing roosting, foraging, and nesting habitat for both species.

Here, we report on a spring survey in 2001 that examined the abundance, distribution, behavior, and habitat use of stilts and avocets in the south bay. We compare our results to those from prior surveys in the early 1970s and 1980s and discuss our findings with respect to various active or proposed restoration projects that may affect future breeding populations of these birds.

STUDY AREA AND METHODS

We surveyed stilts and avocets in San Francisco Bay south of the San Mateo Bridge (Figures 1 and 2) where other studies have focused and where the majority of the estuary's stilts and avocets breed (Gill 1977, Harvey et al. 1992). Two survey teams started on opposite sides of the bay and, in general, moved south to complete coverage of the study area. We searched salt ponds and other wetlands in their entirety for adult stilts and avocets. We also surveyed tidal flats adjacent to salt ponds and marshes that border the bay as far out as we could see. Although we tried to cover all wetlands, some private salt-crystallization ponds were not accessible (see Figure 1 or 2). In addition, outer Bair Island and its immediate vicinity, including adjacent tidal flats, were not surveyed because of difficulties in access. We surveyed 9613 ha of salt ponds, 4068 ha of tidal or diked marshes, 575 ha of other diked wetlands, and approximately 4039 ha of tidal flats.

Study Period and Survey Technique

We surveyed for 120 hours from 15 to 25 May 2001, during the peak breeding period for stilt and avocets in the south bay (PRBO unpubl. data; see also Robinson et al. 1997, Robinson et al. 1999). Two teams of two or

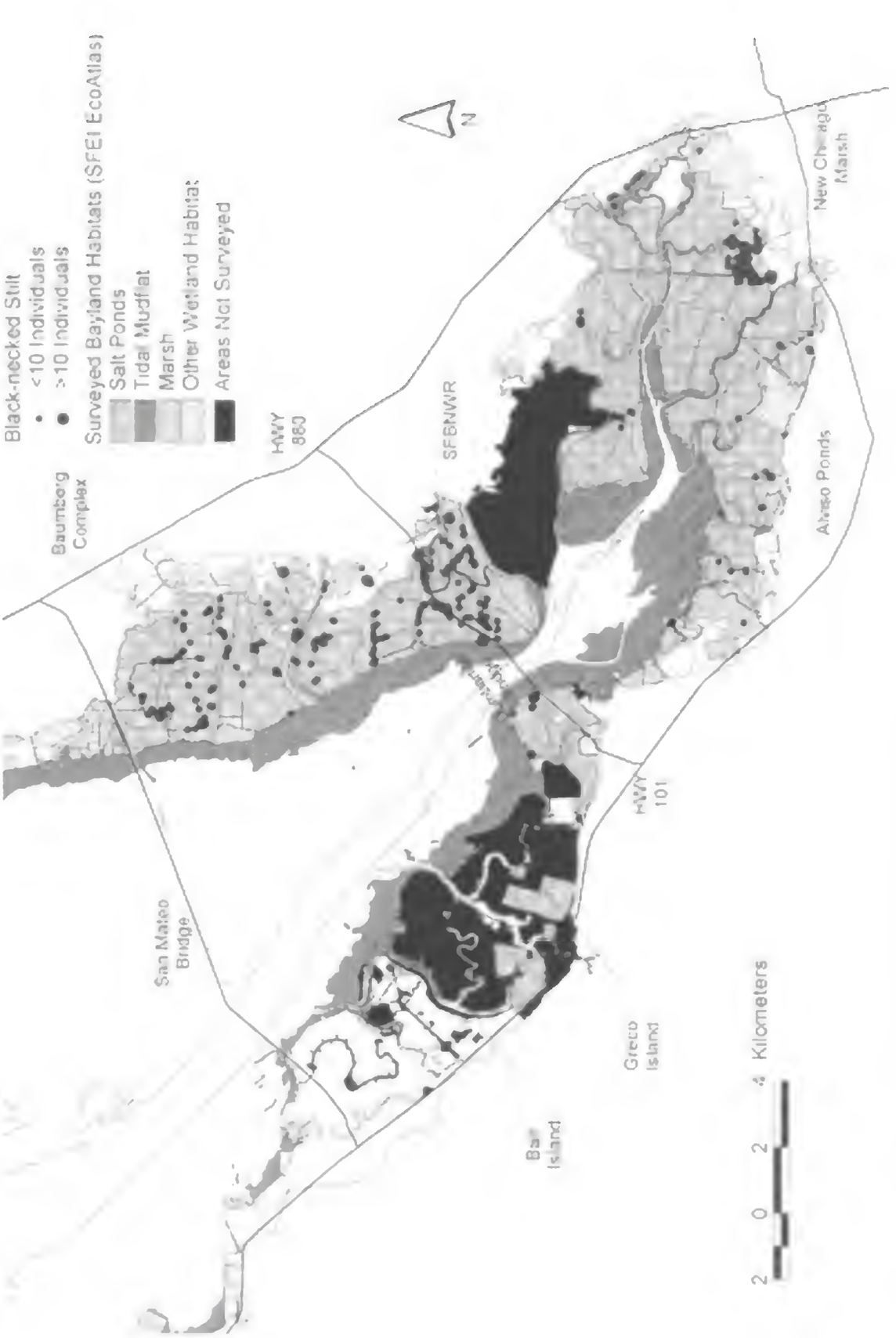

Figure 1. Locations of Black-necked Stilts during a breeding survey of South San Francisco Bay, May 2001. SFBNWR, Don Edwards San Francisco Bay National Wildlife Refuge.

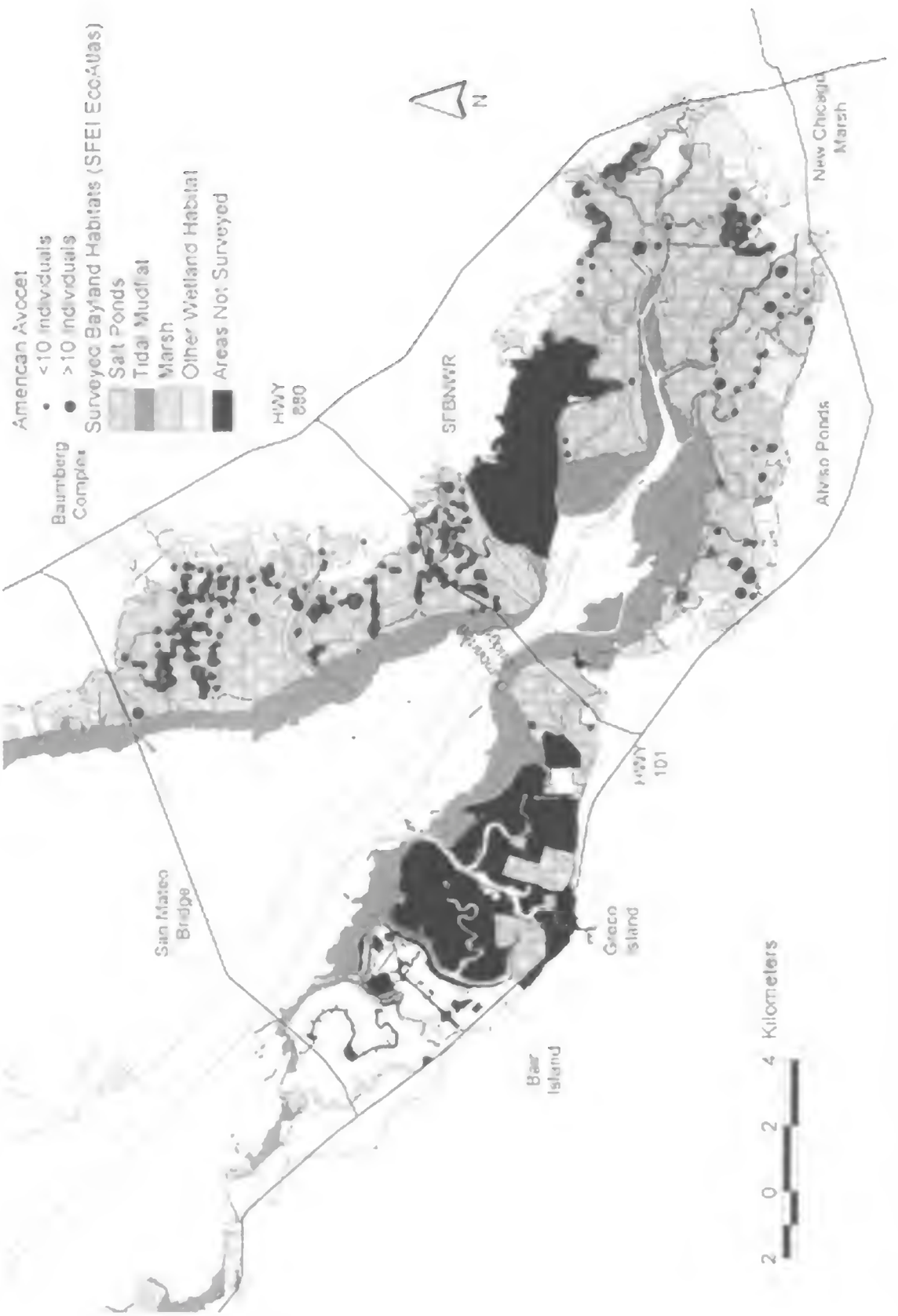

Figure 2. Locations of American Avocets during a breeding survey of South San Francisco Bay, May 2001. SFBNWR, Don Edwards San Francisco Bay National Wildlife Refuge.

three observers drove or walked all levees and roads, counting from vehicles or exiting the vehicle to count areas requiring a greater field of view, using spotting scopes and binoculars. Although locating nests was not the goal of the survey, we recorded all nests that we found. We tried to avoid disturbing nesting birds, but in a few areas of high nesting activity, observers walked levees and counted nests and eggs.

Data collected for adult birds included number of individuals, behavior, habitat, microhabitat, and observed breeding status. Adults' behavior was recorded as (1) alarm (alarm calling though not actively engaged in a distraction display), (2) brooding (adults attending young), (3) breeding display (copulation or postcopulatory display), (4) distraction display (mobbing behavior or broken-wing display), (5) feeding (eating or searching for food), (6) incubating (sitting on or standing at a nest), (7) roosting (sitting, standing, or preening), (8) alert (standing in an alert posture and not alarm calling), or (9) other. We did not use incomplete and/or questionable behavior observations for analysis (<2% of total observations). For most analyses, we grouped behaviors as potential breeding, feeding, or other behaviors. Breeding activities included brooding, breeding display, distraction display, and incubation behaviors. Feeding and swim-feeding behaviors made up the feeding category, while alarm, alert, roosting, and other behaviors constituted the other category.

For analysis, we categorized habitats as: marsh, salt pond, tidal flat, or other wetland. Marshes included all tidal, freshwater, diked, and vegetated marshes. Other wetland habitat included other diked wetlands, sewage ponds, and miscellaneous habitats. Salt ponds and tidal mudflats were their own categories.

We categorized microhabitats as (1) channel (channel or slough within a habitat), (2) dike (on side or top of dike or levee bordering a habitat), (3) island (of dry substrate that could not be covered by water in a strong wind), (4) mud (dry or wet, including shallow water <10 cm deep), (5) shore (wet or dry substrate within 1 m of shoreline), (6) vegetated marsh, or (7) water (>10 cm deep). We chose 10 cm as an approximate cut-off depth because water depths of > 10 cm preclude use by most shorebirds except those that swim (Safran et al. 1997, Isola et al. 2000).

We plotted locations of observations on maps visually, then transferred them to a geographic-information system by means of ArcView 3.2a (ESRI, Redlands, CA).

Statistics

We tested for differences between species in frequencies of behavior, habitat, and microhabitat use with Pearson's χ^2 test (Snedecor and Cochran 1967), using Stata (version 6.0; Stata Corp., College Station, TX). For our analysis comparing observed versus expected habitat use of stilts and avocets, we calculated the expected frequency of habitat use based on the area of each habitat we surveyed (see Methods above). For instance, marshes constituted 22.2 % of the habitat we compared (Table 1); therefore, the expected frequency of the 401 observations of Black-necked Stilts for that habitat was 89 observations. For all analysis, we recorded groups of

Table 1 Habitat Use of Black-necked Stilts and American Avocets During Surveys of South San Francisco Bay, California, May 2001

	Black-necked Stilt Observed	American Avocet Observed	Expected[a]
Marsh[b]	29.2%	13.5%	22.2%
Salt pond	55.4%	75.6%	52.6%
Tidal mudflat	1.2%	1.3%	22.2%
Other wetland[c]	14.2%	9.6%	3.2%
Total observations[d]	401	757	

[a]Expected use based on available habitat (see Methods).

[b]Marsh habitat includes both fresh and salt marshes.

[c]Other wetlands include diked wetlands, sewage ponds, and other habitats.

[d]In all habitats combined.

individuals engaged in the same behavior at the same time and place as one observation to avoid violating assumptions of independence of observations (Martin and Bateson 1986). Statistical tests were two-tailed, and differences were considered significant at $P = 0.05$.

RESULTS

We recorded 1184 adults and 71 chicks of the Black-necked Stilt, 2765 adults and 189 chicks of the American Avocet. Of 397 behavior observations of stilts, 30.5% were breeding, 42.3% were feeding, and 27.2% as other behaviors. Of 753 observations of avocets, 35.5% were breeding, 32.7% were feeding, and 31.9% were recorded as other behaviors.

Salt ponds, the most extensive habitat we surveyed, contained the greatest numbers of stilts and avocets (Table 1). Marshes held the next largest numbers, followed by other wetlands and tidal mudflat. Both species' observed habitat use differed significantly from that expected if use was random use (Black-necked Stilt, $\chi^2_3 = 106.8$, $P = 0.000$, if tidal flats are excluded, $\chi^2_2 = 22.6$, $P = 0.000$; American Avocet, $\chi^2_3 = 211.4$, $P = 0.000$, if tidal flats are excluded, $\chi^2_2 = 54.1$, $P = 0.000$; Table 1). If analyses are restricted to nesting birds, both species' habitat use also differed significantly ($\chi^2_2 = 53.5$, $P = 0.000$). Of the 137 Black-necked Stilt nests described, 21% were in marshes, 69% were around salt ponds, and 9% were in other habitats, whereas of the 409 American Avocet nests described, 3% were in marshes, 93% were around salt ponds, and 4% were in other habitats. There was no significant difference in habitat use of stilts and avocets with broods ($\chi^2_2 = 2.21$, $P = 0.33$). Of the 15 Black-necked Stilt broods described, 20% were in marshes, 53% were around salt ponds, and 27% were in other habitats, whereas of the 63 American Avocet broods described, 11% were in marshes, 73% were around salt ponds, and 16% were in other habitats. We observed five groups of stilts and ten of avocets using tidal flats (Table 1).

Table 2 Comparison of Observed Microhabitat Use by Black-necked Stilts and American Avocets within Marshes and Salt Ponds of South San Francisco Bay, California, May 2001

	Marshes		Salt Ponds	
Microhabitat	Stilt	Avocet	Stilt	Avocet
Channel	2.6%	10.8%	—[a]	—
Levee	—	—	13.1%	18.7%
Island	1.7%	2.9%	31.1%	39.5%
Mudflat/open water	42.7%	51.0%	26.1%	24.7%
Shoreline	—	—	29.7%	16.4%
Vegetated marsh	47.9%	34.3%	—	—
Other	5.1%	1.0%	0%	0.7%
Total groups[b]	117	102	222	572

[a]—, microhabitat not present in broader habitat category.

[b]All microhabitats combined (see Methods).

Stilts and avocets differed in microhabitat use in both marshes ($\chi^2_4 = 12.3$, $P = 0.016$) and salt ponds ($\chi^2_4 = 21.8$, $P = 0.000$). In marshes, stilts were most often observed in vegetated areas, followed by mudflat/open water habitat, whereas for avocets, the pattern was reversed (Table 2). In salt ponds, both species were most often observed on islands, but their order of use of other microhabitats in salt ponds differed (Table 2).

DISCUSSION

Only individuals exhibiting breeding behaviors considered, the minimum number of breeding Black-necked Stilts and American Avocets in the south bay was 270 and 879 birds, respectively. Undoubtedly these are underestimates, given that in the breeding season birds frequently engage in other behaviors or are between nesting attempts (Gibson 1978). If all stilts and avocets we counted were breeding and the sex ratio is 1:1 (Robinson et al. 1997, Robinson et al. 1999), there were approximately 590 pairs of stilts and 1380 pairs of avocets in the south bay. An unknown proportion of our estimated breeding birds were likely nonbreeders because not all individuals of both species breed in their first year and some nonbreeding avocets summer in nesting areas (Robinson et al. 1997, Robinson et al. 1999). Our estimate of 590 pairs of the Black-necked Stilt in the south bay is within the range of previous estimates of 400–650 pairs (Gill 1972, Rigney and Rigney 1981). Our estimate for breeding avocets also falls within the broader range of 650–1800 pairs from prior studies in the south bay (Gill 1972, Rigney and Rigney 1981).

Different counting techniques and coverage areas may account for many of the differences in estimates of stilt and avocet breeding populations in San

Francisco Bay. These differences are difficult to evaluate since exact areas that were covered on previous surveys are unknown. Gill (1972) did not survey all available south bay habitat. He relied on extrapolations to estimate 1800 pairs of breeding avocets, using the product of average nearest-neighbor nesting distances multiplied by miles of insular and noninsular levees. His estimate of 400–500 breeding stilt pairs was based on "impressions of adults observed throughout certain sections of the South Bay" (Gill 1972). Rigney and Rigney (1981) also did not survey all available habitat in the south bay, but they employed a calculation that combined amount of the study area covered, percent of nesting missed because of survey timing, and number of birds observed.

We too were unable to survey parts of the south bay, and this may affect our estimates of breeding stilts and avocets. However, much of our unsurveyed area consisted of salt-crystallizing ponds and developed bay fill. Waterbirds' use of ponds whose salinity is over 250 parts per thousand is consistently low (Takekawa et al. 2000, Warnock et al. 2002), in part undoubtedly because of the lack of invertebrate prey at these high salinities (Goals Project 2000). Potentially good habitat exists on outer Bair and Greco islands, which we did not cover. Gill (1971), however, found only two avocet scrapes on outer Bair Island, and our recent visits to the island revealed no colonies of breeding stilts or avocets (San Francisco Bay Bird Observatory unpubl. data).

In parts of the West, breeding and wintering avocet populations have increased (Colwell et al. 2001), but that does not appear to be the case in San Francisco Bay. We know of no other sites on the Pacific coast of the United States that have breeding-season numbers of stilts and avocets approaching those in the south bay (see also Small 1994). Some regions in the California interior, including the Klamath Basin (D. Shuford pers. comm., Small 1994), Central Valley (Small 1994), and Salton Sea (Shuford et al. 2000), may hold higher breeding numbers than the south bay in some years.

Since the 1980s, core breeding sites for stilts and avocets in the south bay have changed somewhat. Gill (1972) and Rigney and Rigney (1981) reported concentrations of breeding stilts and avocets in the Alviso salt ponds at the southern tip of the bay. We also found concentrations in the Alviso region, especially around New Chicago Marsh. Highest numbers, however, were on the east side of the south bay, between the San Mateo and Dumbarton bridges and just south of the Dumbarton Bridge (Figures 1 and 2). We located 77 avocet and 9 stilt nests in the Baumberg region, whereas Rigney and Rigney (1981) found 2 avocet and 5 stilt nests there. Presumably, long-term habitat change during the past 20 years has altered distributions of nesting stilts and avocets in the south bay. Short-term alterations can affect the breeding populations as well. Active management of salt ponds can change the ponds' depth and other features (Ver Planck 1958) rapidly enough to make foraging or breeding habitat for stilts and avocets suitable or unsuitable in a matter of days.

Our study points out differences in the use of south bay habitats by stilts and avocets during the breeding season. Salt ponds contained more than

half of all stilt and three-quarters of all avocet observations, surpassing expected use as a function of habitat availability. As well as being important breeding habitat for both species, salt ponds also serve as important foraging and roosting areas in winter (Swarth et al. 1982, Takekawa et al. 2001, Warnock et al. 2002).

The high use of marshes by stilts in the south bay mirrors the pattern found in other areas (Hamilton 1975, Robinson et al. 1999). American Avocets (adults and nests) were found less frequently in marshes than were stilts, and within this habitat most avocets were observed in open areas of shallow water. The New Chicago Marsh, a managed tidal marsh in the Alviso region, was an exception, as it held high numbers of breeding avocets and stilts (Figures 1 and 2). The uneven topography of this historical tidal marsh provides a variety of microhabitats including shallow ponded water, vegetation, and mudflats (S. Macias pers. comm.). The marsh is protected from tidal influence by a group of salt ponds bordering its northern edge. This closeness of the pickleweed- (*Salicornia* spp.) dominated marsh to salt ponds and the marsh's relatively stable water levels appeared to create a suitable rearing area for young stilts and avocets. The pickleweed was tall enough to provide the young cover from predators, and the nearby salt ponds provided an abundant supply of insects such as brine flies (*Ephydra* spp., W. A. Maffei in Goals Project 2000, pp. 179–182) for foraging broods of stilts and avocets moving between these habitats.

Tidal flats were little used by stilts and avocets during the breeding season. Similar observations of low use of tidal flats by avocets were reported by Boettcher et al. (1995), who found 3% and 6% of all observed nonbreeding avocets using tidal flats in coastal South Carolina in 1991 and 1992, respectively. Swarth et al. (1982) and Harvey (1988) also rarely observed stilts using tidal mudflats in San Francisco Bay.

Other studies have shown levees to be important nesting sites for stilts and avocets (Gill 1973, Hamilton 1975, Rigney and Rigney 1981, Robinson et al. 1997, Robinson et al. 1999). We found fewer than 20% of the stilts and avocets on levees during our breeding survey and greatest use on islands. In the south bay, it is likely levees are used for breeding less often than are islands because of their accessibility to human disturbance (C. Rintoul pers. obs.) and to mammalian predators, such as the introduced Red Fox (*Vulpes vulpes*) (E. K. Harding in Goals Project 2000, pp. 252–252). Gill (pers. comm.) suggests that his 1971 study may have found more use of levees by stilts and avocets because it predated the arrival of the Red Fox in the south bay. We found islands, including old fragmented levees separated from the surrounding network, heavily used by stilts and avocets, as noted in other studies (Gill 1973, Rigney and Rigney 1981, Swarth et al. 1982, Robinson et al. 1997, Robinson et al. 1999).

Our results reconfirm the importance of South San Francisco Bay as a breeding area for stilts and avocets on the Pacific coast of the United States. Annual fluctuations of nesting stilts and avocets probably exist, and monitoring is needed to understand this variability better. Current conservation proposals for San Francisco Bay (i.e., Goals Project 1999) include the conversion of existing habitats, especially salt ponds, into tidal marsh. The

effects of the conversion of part of 6475–8500 ha of salt ponds to tidal marshes will likely be negative on breeding avocets, whereas the effects on the stilt are more difficult to predict. For both species, modification of tidal marshes to include features of salt ponds like open bodies of shallow water for foraging and islands for breeding may be beneficial. Additional research is necessary to investigate these species' differences in diet in the south bay marshes and salt ponds.

ACKNOWLEDGMENTS

We are indebted to the Gabilan Foundation and the Rintels Charitable Trust for generous financial support. Logistic support was provided by Clyde Morris of the Don Edwards San Francisco Bay National Wildlife Refuge, Chuck Taylor of Cargill Salt Division, John Takekawa of the Biological Resources Division, United States Geological Survey, Steve Quick of the East Bay Regional Parks, and Sunnyvale Baylands. We offer special thanks to Sue Macias for helping collect data and to Diana Stralberg for GIS help. Drafts of this paper were improved by comments from David Shuford, Bob Gill, Tim Manolis, and an anonymous reviewer. This is contribution 1082 of PRBO Conservation Science.

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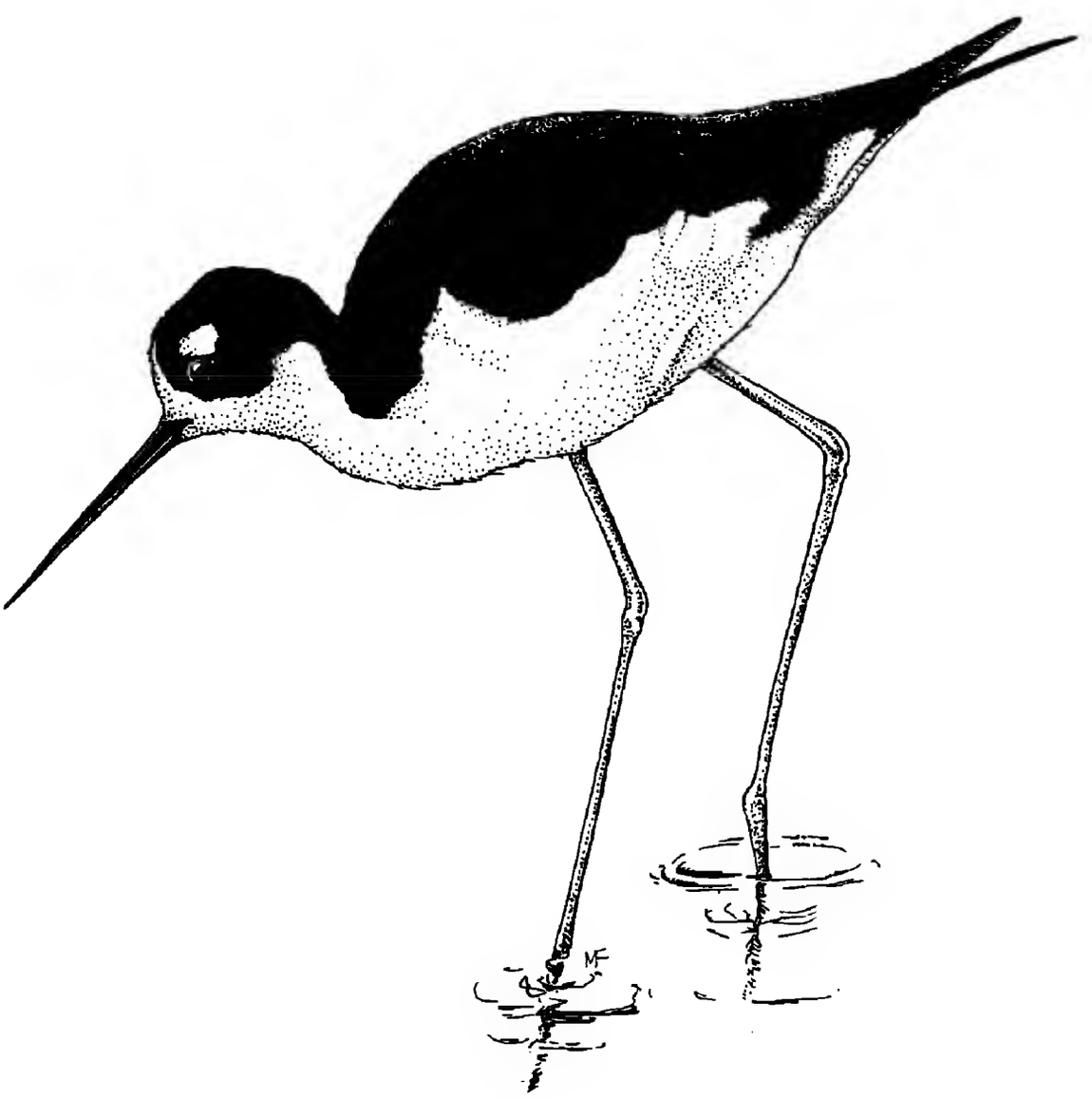
Accepted 15 December 2002



Black-necked Stilt

Sketch by © Marni Fylling

REPORT OF THE CALIFORNIA BIRD RECORDS COMMITTEE: 2001 RECORDS

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ABSTRACT: In 2001, the California Bird Records Committee reached decisions on 194 records of 66 species, accepting 161 of them. New to California were the Greater Sand-Plover (*Charadrius leschenaultii*), Common Greenshank (*Tringa nebularia*), and Eyebrowed Thrush (*Turdus obscurus*), bringing California's bird list to 619 species, nine of which are not native. Potential first state records of the Wood Sandpiper (*Tringa glareola*), Nazca Booby (*Sula granti*), and Black-backed Oriole (*Icterus abeillei*) were not accepted, the first on grounds of identification and the last two because of concerns about natural occurrence. Other significant accepted records include California's second Glossy Ibis (*Plegadis falcinellus*) and Red-legged Kittiwake (*Rissa brevirostris*), second and third Greater Shearwaters (*Puffinus gravis*), and the strongest annual showings in California of the Galapagos/Hawaiian Petrel (*Pterodroma phaeopygia/sandwichensis*), Reddish Egret (*Egretta rufescens*), and Scarlet Tanager (*Piranga olivacea*) on record.

This 27th report of the California Bird Records Committee (hereafter the CBRC or the Committee) summarizes decisions reached on 194 records of 66 species. Although most records pertain to birds found in 2001, the period covered by this report extends from 1994 to 2001. Three of the reviewed records were reassessments of earlier Committee decisions. The Committee accepted 159 records involving 55 species; this acceptance rate of 83% was just above the Committee's mean as detailed by Rottenborn and Morlan (2000), who discussed trends in acceptance rates though the CBRC's history. Twenty-five records of 20 species were not accepted because of insufficient documentation or because descriptions were inconsistent with known identification criteria; one of these was a reassessment of a record previously not accepted. Eight additional records of five species were not accepted because of questions concerning the bird's natural occurrence. Finally, two other records originally accepted as the Masked Booby (*Sula dactylatra*) prior to the species-level revision adopted by the American Ornithologists' Union (2000) were reassessed and accepted only to the level of Masked/Nazca booby (*S. dactylatra/granti*). Counties best represented by accepted records were San Diego (30 accepted records, including seven of the Reddish Egret, *Egretta rufescens*), Kern (13), San Francisco (11), Los Angeles (8), Monterey (8), and Santa Barbara (8). Records were accepted from 28 of California's 58 counties.

Highlights of this report include the addition of three species to the California list: the Greater Sand-Plover (*Charadrius leschenaultii*), Common Greenshank (*Tringa nebularia*), and Eyebrowed Thrush (*Turdus obscurus*). With these additions, California's list stands at 619 species, nine of which are non-native, and two of which have been extirpated within historical times. A report of a Wood Sandpiper (*Tringa glareola*), a potential first state record, was not accepted because documentation was insufficient

to establish the identification conclusively. Potential first state records of the Nazca Booby (*Sula granti*) and Black-backed Oriole (*Icterus abeillei*) were not accepted because of questions of natural occurrence. Records of the Black-capped Petrel (*Pterodroma hasitata*), Falcated Duck (*Anas falcata*), Crested Caracara (*Caracara cheriway*), Demoiselle Crane (*Anthropoides virgo*), Slaty-backed Gull (*Larus schistisagus*), Eurasian Collared-Dove (*Streptopelia decaocto*), and Yellow-breasted Bunting (*Emberiza aureola*) are currently under consideration.

Other highlights of this report include the second accepted California record of the Glossy Ibis (*Plegadis falcinellus*), the second (both specimens) of the Red-legged Kittiwake (*Rissa brevirostris*), and the second and third of the Greater Shearwater (*Puffinus gravis*). We also report record annual showings of the Hawaiian/Galapagos Petrel (*Pterodroma sandwichensis/phaeopygia*; four records), Reddish Egret (*Egretta rufescens*, which was removed from the Review List in January 2002 in part because of this spate of 13 new records), and Scarlet Tanager (*Piranga olivacea*, with the twelve records for 2001 exceeding the previous high of nine for 1987). Also recorded in relatively high numbers were the Curlew Sandpiper (*Calidris ferruginea*, with four records matching 1981's total), Yellow-throated Vireo (*Vireo flavifrons*, with ten 2001 records equaled only by 1992's showing), and Cassin's Sparrow (*Aimophila cassinii*, four records).

The list of species currently reviewed by the CBRC is posted at Western Field Ornithologists' web site (http://www.wfo-cbrc.org). This site also includes the entire California state list, the Committee's bylaws, a reporting form for the direct e-mail submission of records to the CBRC, the addresses of current Committee members, a photo gallery of recent submissions (including several birds published in this report), and other information about the CBRC, WFO, and its journal, *Western Birds*.

All documentation reviewed by the CBRC, including copies of descriptions, photographs, videotapes, audio recordings, and Committee comments, is archived at the Western Foundation of Vertebrate Zoology, 439 Calle San Pablo, Camarillo, California 93012, and is available for public review. The CBRC solicits and encourages observers to submit documentation for all species on the review list, as well as species not on the state list. Documentation should be sent to Guy McCaskie, CBRC Secretary, P. O. Box 275, Imperial Beach, CA 91933-0275 (e-mail: guymcc@pacbell.net).

Committee News. The Committee's voting membership after the 18 January 2003 annual meeting consisted of Luke W. Cole, Richard A. Erickson (chairman), Kristie N. Nelson, Todd A. McGrath, Joseph Morlan, Peter Pyle, Michael M. Rogers (vice-chairman), Mike San Miguel, John C. Sterling, and John C. Wilson. Guy McCaskie continues his role as nonvoting Secretary. Recent Committee members who also voted on many of the records in this report include Jon L. Dunn, Kimball L. Garrett, Robert A. Hamilton, Matthew T. Heindel, Alvaro Jaramillo, Guy McCaskie, Tristan McKee, Michael A. Patten, Stephen C. Rottenborn, Daniel S. Singer, and Scott B. Terrill. No changes in the review list were adopted at the January 2003 meeting. The Committee placed the Nazca Booby on the Supplemental List, as discussed below under that species (see "Records Not Accepted, Natural Occurrence Questionable").

Format and Abbreviations. As in other recent CBRC reports, records are generally grouped geographically and/or are listed chronologically by first date of occurrence. Included with each record is the location, county abbreviation (see below), and date span. The date span usually follows that published in *North American Birds* (formerly *American Birds* and *Field Notes*), but if the CBRC accepts a date span that differs from a published source, the differing dates are italicized. Initials of the observer(s) responsible for finding and/or identifying the bird(s)—if known and if they supplied supportive documentation—are followed by a semicolon, then the initials, in alphabetical order by surname, of additional observers submitting supportive documentation, then the CBRC record number consisting of the year of submission and a chronological number assigned by the secretary. All records are sight records unless otherwise indicated: initials followed by a dagger (†) indicate the observer supplied a supportive photograph, (‡) indicates videotape, (§) indicates a voice recording, and (#) indicates a specimen record, followed by the abbreviation (see below) of the institution housing the specimen and that institution's specimen catalog number.

An asterisk (*) prior to a species' name indicates that the species is no longer on the CBRC Review List. The first number in parentheses after the species' name is the number of records accepted by the CBRC through this report; the second is the number of new records accepted in this report (because this number excludes records thought to pertain to returning individuals, it may be zero). Two asterisks (**) after the species' total indicate that the number of accepted records refers only to a restricted review period or includes records accepted for statistical purposes only; see Roberson (1986) for more information.

When individual birds return to a location after a lengthy or seasonal absence, each occurrence is reviewed under a separate record number, and Committee members indicate whether or not they believe the bird is the same as one accepted previously. Such decisions follow the opinion of the majority of members and, if a bird is considered a returning individual, the total number of records remains unchanged. Although the CBRC does not formally review the age, sex, or subspecies of each bird, information on these subjects is often provided during the review process, and in some cases the Committee achieves a strong or unanimous consensus. We report much of this information.

The CBRC uses standard abbreviations for California counties; those used in this report are ALA, Alameda; BUT, Butte; DN, Del Norte; HUM, Humboldt; IMP, Imperial; INY, Inyo; KER, Kern; LA, Los Angeles; MRN, Marin; MEN, Mendocino; MOD, Modoc; MNO, Mono; MTY, Monterey; ORA, Orange; PLU, Plumas; RIV, Riverside; SBE, San Bernardino; SD, San Diego; SF, San Francisco; SLO, San Luis Obispo; SM, San Mateo; SBA, Santa Barbara; SCL, Santa Clara; SCZ, Santa Cruz; SIS, Siskiyou; SOL, Solano; SON, Sonoma; SUT, Sutter; VEN, Ventura; and YUB, Yuba. A full list of county abbreviations is available on the WFO–CBRC web site. Other abbreviations used: I., island; km, kilometer(s); L., lake; mi., mile(s); Mt., mountain; n. miles, nautical miles; N.W.R., national wildlife refuge; Pt., point; R., river; W.M.A., wildlife management area.

Museum collections housing specimens cited in this report, allowing access to Committee members for research, or otherwise cited, are the California Academy of Sciences, San Francisco (CAS), Natural History Museum of Los Angeles County, Los Angeles (LACM), Pacific Grove Museum, Pacific Grove (PGM), San Diego Natural History Museum (SDNHM), and Western Foundation of Vertebrate Zoology, Camarillo (WFVZ).

RECORDS ACCEPTED

SHY ALBATROSS *Thalassarche cauta* (3, 1). One immature was over Bodega Canyon (38° 03.05' N, 123° 21.93' W), MRN, 27 Jul 2001 (DWN†; 2001-143; Figure 1). Many members concluded that it best fit the subspecies *salvini*, but others did not believe that we yet have the knowledge to assign immature birds to subspecies confidently, particularly as there are no specimens of *salvini* from the Northern Hemisphere (for identification criteria and distributional information see Cole 2000). The majority of Committee members agreed that this was likely an individual different from the one at nearby Cordell Bank, MRN, 29 Jul–10 Sep 2000 (McKee and Erickson 2002). At least one additional record, 25 Sep 1999 off Sonoma County (*NAB* 55:98), has not completed circulation through the Committee, and another 17 Sep 2000 off Marin County (*NAB* 55:98) has not been submitted.

HAWAIIAN/GALAPAGOS PETREL *Pterodroma sandwichensis/phaeopygia* (12, 4). One was at 37° 48.4' N, 123° 22.6' W, 10 km W of Fanny Shoal, SF, 9 May 2001 (DAi; 2001-142); one was at 34.195° N, 122.687° W, ca. 100 miles W of Pt. Conception, SBA, 25 Jul 2001 (RTS; 2001-132); one was at 39° 32.61' N, 123° 57.61' W, 8 miles W of Laguna Pt., MEN, 18 Aug 2001 (SNGH; GGi, RJK, TMcK, SBT; 2001-134); and one was at 121° 9.61' N, 34° 29.58' W, about 29 mi. WSW of Pt. Arguello, SBA, 28 Apr 2001 (BS, DMH; DMC, MLF, MMe; 2001-076). All were accepted unanimously as belonging to this species pair, which resulted from the split of the Dark-rumped Petrel (Banks et al. 2002) . The April date is the earliest for California (the previous early record was 3 May). The May bird was described briefly but acceptably; it was submitted as a Hawaiian Petrel, but no features that would eliminate the Galapagos Petrel were reported. The question of which of these taxa (if not both) reaches California waters has not been resolved, although distributional evidence suggests a Hawaiian origin for some or all; field identification criteria, if they exist, remain poorly developed.

GREATER SHEARWATER *Puffinus gravis* (3, 2). One was 1–2 n. miles N to NW of Pt. Pinos (c. 38° 54' N, 121° 54' W), MTY, 13–15 Jan 2001 (EH, CAS, WS, LST, SBT; 2001-093). This bird was originally found (but not documented) on 13 Jan by a veteran pelagic birding trip skipper in Monterey Bay; it was seen briefly two days later but acceptably described. This record is significant, as the acceptance of the only other winter report for California (24 Feb 1979 in Monterey Bay, MTY; 1979-017) was ultimately overturned (Erickson and Terrill 1996). At its 2003 meeting the Committee decided to reassess this record yet again. Another Greater Shearwater was photographed 15 mi. W of Davenport, SCZ, 8 Oct 2001 (2001-172; TMcG; CK, JPo†).

MANX SHEARWATER *Puffinus puffinus* (65, 4). One seen from Pigeon Pt., SM, 21 May 1999 (RST; 1999-110) was finally accepted on the fourth circulation. One seen from Pt. Piedras Blancas, SLO, 31 May 2001 (RAR; 2001-103) was accepted with one dissenting vote; the dissenter was concerned about the use of a single description to apply to birds seen on different days (records of two seen earlier in May 2001 are still in circulation). One was seen from Southeast Farallon I., SF, 17 Oct

Figure 1. Shy Albatross, *Thalassarche cauta*, 27 July 2001, over Bodega Canyon, off Marin County. Some features suggest that this bird is of the subspecies *salvini*, but that determination remains unresolved.

Photo by Dan W. Nelson

2001 (AB; 2002-009). One 5 mi. off Pt. Vicente, LA, 17 Mar 2001 (MJSM; 2001-067) was the first for Los Angeles County and the southernmost for California.

MASKED BOOBY *Sula dactylatra* (16, 1). A subadult was at La Jolla Cove, SD, 30 Dec 2001–10 Jan 2002 (FBe†, WmB†, NF, DFu†, ABL, CAM, GMcC, AM†, JM, RTP, MSanM, LSa†, JWe†, JEZ; 2002-001). Whether this bird should be considered the same as the one later found to the north in Orange County in February and March 2002 (*NAB* 56:223) is not yet resolved.

MASKED/NAZCA BOOBY *Sula dactylatra/granti* (5, 2). Two older records, accepted as the Masked Booby prior to the split by the American Ornithologists' Union (2000), were reevaluated and accepted only to the level of the species pair. One was at 38° 54.24′ N, 123° 56.48′ W, ca. 10 mi. W of Pt. Arena, MEN, 15 Jun 1997 (M Fo; 1997-130A). This bird was perhaps in its second calendar year; a minority of Committee members concluded that "pale yellowish" in the bill and a broad white cervical collar sufficed to identify the bird as a Masked; see also Rottenborn and Morlan (2000). A juvenile 3 mi. S of White's Pt., LA, 30 Apr 1994 (MSanM, SLW†; 1994-084) was unanimously considered unidentifiable to species within this sibling pair (see also Howell and Pyle 1997). For further information on these species see Pitman and Jehl (1998) and Roberson (1998).

BROWN BOOBY *Sula leucogaster* (70, 1). One adult female was 7.7 n. miles SSW of Davenport, SCZ, 20 Oct 2001 (LML‡, EP†; 2001-211).

TRICOLORED HERON *Egretta tricolor* (32**, 3). One immature was along the southeastern shore of the Salton Sea near the intersection of Lack and Lindsey roads, IMP, 30 Sep–3 Dec 2001 (GMcC; BLaF, NLaF, BM†; 2001-159). One immature was at the Tijuana R. estuary, SD, 29 Dec 2001 (GMcC; 2001-225). An adult was along lower San Diego Creek in Irvine, ORA, 16–29 Sep 2001 (BEDa†; 2002-047). The last record was supported only by photographs, prompting one vote to not accept (the Committee urges observers to augment photographs with written details).

*REDDISH EGRET *Egretta rufescens* (93, 13). One adult at the Tijuana River mouth, SD, 25 Aug–23 Dec 2001 (MJI, GMcC; 2001-136) was the same bird with

a slightly deformed bill that has been wintering in this area each year since first found on 18 Dec 1982; the age of this bird far exceeds the species' maximum published longevity of 12 years, 3 months (Lowther and Paul 2002). New records were of one adult on s. San Diego Bay, SD, 7–12 Sep 2001 (MJI; MBS†; 2001-151); an immature on s. San Diego Bay, SD, 9 Sep–9 Nov 2001 (MJI; GMcC, BCM, MBS†; 2001-148); an immature at the San Diego R. mouth, SD, 1 Jan–18 Apr 2001 (MBM†; 2001-014) and another there 3 Sep 2001–22 May 2002 (DFu†, MJI, GMcC, JM, MPo†; 2001-149); an adult at the San Diego R. mouth 12 Oct 2001–12 Feb 2002 (DFu†, GMcC, JM; 2001-174); an immature at Batiquitos Lagoon, SD, 6 Sep–12 Dec 2001 (GLR; 2001-182); and an adult at Bolsa Chica Ecological Reserve, ORA, 6 Apr 2001 (BEDa; 2001-109). All of these birds were on the extreme southern coast of California where the species is now regular. An immature at the mouth of Bell Creek in Goleta, SBA, 14 Jul–11 Sep 2001 (JSt†; MB, DMC, RAH, NL, MSanM; 2001-117) was north of the areas of regular occurrence. One immature at the Whitewater R. mouth, RIV, 7 Jul 2001 (GMcC; C-TL, BLS†; 2001-115), one immature near Salton City, IMP, 1 Aug 2001 (GMcC; 2001-126), and one 2nd-year bird at Obsidian Butte, IMP, 28 Jul–19 Aug 2001 (LMD†, KZK†, GMcC, PS; 2001-125), joined by an immature 17 Aug–12 Oct 2001 (KZK†; GMcC, PS; 2001-146; Figure 2), were inland at the Salton Sea where the Reddish Egret is casual to rare. An immature at Little Lake, INY, 29 Sep–4 Oct 2001 (JLD, JHe†, TH, JPa, DPa; 2001-217) was also inland and the first for Inyo County. Obviously it is uncertain how many individuals were involved, as traveling up and down the coast by some birds is probable. This spate of reports in 2001 was a factor in the removal of the Reddish Egret from the Review List at the CBRC's January 2002 meeting (McKee and Erickson 2002). The species remains exceptionally rare in the interior (away from the Salton Sea) and on the coast north of Orange County.

YELLOW-CROWNED NIGHT-HERON *Nyctanassa violacea* (19, 0). A continuing adult at Scripps Institute of Oceanography in La Jolla, SD, was documented 25 Mar–17 Apr 2001 (GMcC; 2001-069); this bird, the same as 2000-074 (McKee and Erickson 2002), was first found in 1981 (Binford 1985). Another returning adult was at Famosa Slough in San Diego, SD, 17–19 May 2001 (MMa†; 2001-105); it was first found with nesting Black-crowned Night-Herons (*Nycticorax nycticorax*) at nearby Sea World Mar–Apr 1998 and seen 3 May 2000 at Famosa Slough, but documentation for those earlier reports was never submitted to the Committee.

GLOSSY IBIS *Plegadis falcinellus* (2, 1). An adult in alternate plumage was well studied and photographed at Alviso, SCL, 14–15 May 2001 (MMR†; LCh†, AME, DoG†, MJM, JM, RWR, SBT†; 2001-079; Figure 3). The committee inferred unanimously that a similar adult at nearby Hayward Regional Shoreline, ALA, 20–21 May 2001 (PD, SJ, RJR; 2001-104) was the same individual as at Alviso. At both sites this Glossy Ibis was associating with a group of migrant White-faced Ibises (*P. chihi*). The previous accepted record of the Glossy Ibis for California was from Imperial County 1–15 Jul 2000 (Patten and Lasley 2000, McKee and Erickson 2002); other records from that period in Imperial County are still under review.

EMPEROR GOOSE *Chen canagica* (66, 3). Two were at Klamath, DN, about 20 Dec 2001–20 Jan 2002 (MS†; LB†; 2002-008). One was at Bodega Harbor, SON, 23 Dec 2001–21 Apr 2002 (WBo†, LWC†, JM, BDP, DEQ, RR, RS†; 2002-004). One was on Southeast Farallon I., SF, 25 Dec 2001–4 Mar 2002 (BW†; 2002-010). Surprisingly, although there are now 66 records of the Emperor Goose for California, none were submitted for the period 24 Feb 1997–20 Dec 2001.

TRUMPETER SWAN *Cygnus buccinator* (30, 4). Two adults were near Marysville, YUB, 14 Dec 2000 (BEDe; 2000-158); the record received one dissenting vote, based in part on forehead shape and pattern. One adult was near Nelson, BUT, 5 Jan 2001

Figure 2. Immature (left) and adult Reddish Egrets, *Egretta rufescens*, 17 August 2001 at Obsidian Butte, south end of Salton Sea, Imperial Co. Exceptional numbers of this species were recorded on the southern coast and in the interior of California in 2001.

Photo by Kenneth Z. Kurland

(JSn; 2001-020). Two adults were 3 mi. S of Alturas, MOD, 26 Jan 2001 (WmB; 2001-036). One was at Tule Lake NWR, SIS, 30 Dec 2001 (MDo; 2002-060).

WHOOPER SWAN *Cygnus cygnus* (7, 1). An adult was at Lake Almanor, PLU, 19 Dec 2001 (CD; 2002-040). Questions of both natural origin and movement of individuals have plagued the few reports of this species in California, but this one was accepted unanimously.

MISSISSIPPI KITE *Ictinia mississippiensis*. (30, 1). One, apparently a second-year bird, was at Furnace Creek Ranch, Death Valley National Park, INY, 25 May 2001 (AME; 2001-088), fitting the late-May-to-July pattern of occurrence that accounts for 80% of California's records; a third of the state's records are from Furnace Creek Ranch.

GREATER SAND-PLOVER *Charadrius leschenaultii*. (1, 1). California's (and North America's) first was exhaustively documented from Bolinas Lagoon, MRN, 29 Jan–8 Apr 2001 (SA, SNGH†; KMB, LWC, MDe‡, JF†, KLG, SK, PLaT†, LML‡, MJM, GMcC, JM, PP, RWR, MMR†, MSanM, LSa†, RS†; 2001-033; Figure 4). The inch-thick package for this record contains descriptions, slides, prints, sketches, identification references, and other documentation and supplementary material, along with Committee members' comments; these are reinforced by videotape. Details of this record were provided by Abbott et al. (2001). Certainly Committee members and California birders in general will no longer make the assumption that the Mongolian Plover (*C. mongolicus*) is the "default" member of this species pair to

Figure 3. Adult Glossy Ibis, *Plegadis falcinellus*, at Alviso, Santa Clara Co., May 2001; this bird, the first for northern California, and representing California's second accepted record, was also reported just to the north in Alameda County on 20 and 21 May 2001.

Photo by Don Ganton

occur in California. The American Ornithologists' Union Committee on Classification and Nomenclature has not yet proposed a convention for the orthography of this species' English name, which has been variously written as Greater Sandplover, Greater Sand Plover, and Greater Sand-Plover. The last best fits that committee's decision to follow the recommendations of Parkes (1978) in forming compound English names, although the AOU's use of "Common Ringed Plover" for *C. hiaticula* indicates some latitude here.

EURASIAN DOTTEREL *Charadrius morinellus*. (9, 1). One was photographed northeast of Calipatria, IMP, 22–23 Jan 2001 (ABr†; 2001-071; Figure 5), representing the first record for southern California and the first winter record for the United States (previous California records fall between 22 August and 21 November). The bird was in a flock of Mountain Plovers (*C. montanus*), a common wintering species in the Imperial Valley. The only other winter record of the dotterel for North America was of one near La Misión, Baja California, ca. 150 km southwest of Calipatria, 30 Jan–1 March 1998 (Erickson et al. 2001). Both locations match the latitude at which most Eurasian Dotterels winter in north Africa and the Middle East (Cramp 1983).

AMERICAN OYSTERCATCHER *Haematopus palliatus*. (18, 1). One at Royal Palms State Beach, Palos Verdes Peninsula, LA, 24 Dec 2001 (DMH; 2002-054) appeared to be a "pure" *H. p. frazari*. There is at least one other record of the American Oystercatcher from this locality, along with several likely representing hybrids with the Black Oystercatcher (*H. bachmani*). Extensive hybridization and

Figure 4. The exhaustive documentation of North America's first Greater Sand-Plover, *Charadrius leschenaultii*, included in-hand measurements and plumage analysis after the bird was trapped at Stinson Beach, Marin Co., on 15 March 2001.

Photo by Steve N. G. Howell

introgression between the American and Black oystercatchers on the Pacific coast of Baja California (with occasional interbreeding likely on the southern California Channel Islands as well) makes assessment of many individuals problematic (see below under records not accepted; Jehl 1985).

COMMON GREENSHANK *Tringa nebularia* (1, 1). A juvenile extensively photographed at the Mad R. estuary in McKinleyville, HUM, 27 Aug–15 Sep 2001 (LCo‡, MC, JLD, MWE, EE, NF, PAG, EG†, RLeV†, LML‡, MJM, SMcA†, GMcC, TMcK, MSanM, JM, BDP, DEQ, MMR, LSa†, TS, RSu†, DW; 2001-137) was not only the first in California, it was also the first on the Pacific coast of North America south of western Alaska. A photograph appeared on the cover of *W. Birds* 33 (1), 2002. Another sighting in the same area 18–23 Oct 2002, apparently of an adult, is currently under review.

UPLAND SANDPIPER *Bartramia longicauda* (17, 1). One was on Southeast Farallon I., SF, 23–28 Aug 2001 (JT†; 2002-011); two-thirds of California's records are from the period from late August through September.

RED-NECKED STINT *Calidris ruficollis* (9, 1). One adult in alternate plumage was at Moss Landing, MTY, 13–14 Jul 2001 (DGe; DR, DSS†, JSo†; 2001-120); all but two of California's accepted records have been for July.

CURLEW SANDPIPER *Calidris ferruginea* (30, 4). Single alternate-plumaged adults were at Edwards Air Force Base, KER, 24 Jul 2001 (MSanM; DVB, JCW; 2001-123), San Elijo Lagoon, SD, 9 Aug 2001 (DVB†; GMcC, AM†; 2001-129), Tule Lake N.W.R., MOD, 18 Aug 2001 (RE; 2001-139), and Bolsa Chica Ecological Reserve, ORA, 17–21 Sep 2001 (SS; MJI; 2001-152). These four records from a two-month period match the species' highest previous annual total, in 1981; the Kern and Modoc records were county firsts. The preponderance of records of adults in fall suggests that juveniles are perhaps being overlooked.

Figure 5. California's first winter Eurasian Dotterel, *Charadrius morinellus*, was photographed near Calipatria, Imperial Co., 21 January 2001.

Photo by Aaron Brees

LITTLE GULL *Larus minutus* (78, 1). An adult was at Lake Perris, RIV, 28 Jan–15 Mar 2001 (MFr; HK, RF, JM, GMcC, JHo, MSanM; 2001-034).

LESSER BLACK-BACKED GULL *Larus fuscus* (19, 0). A returning adult was at Salton Sea State Recreation Area, RIV, 26 Jan–25 Mar 2001 (CMcG†; 2001-073) and again 11 Nov 2001–28 Feb 2002 (LMD†, JM, MSanM; 2001-202). Another returning adult was at the nearby Whitewater R. mouth at the north end of the Salton Sea, RIV, 10 Jan–6 Feb 2001 (SGl; CMcG†; 2001-039). An adult was at Lake Cunningham in San Jose, SCL, 16 Dec 2001–*22 Mar* 2002 (MMR†, BG; 2002-023); this bird was first discovered as a second-winter bird in October 1997 (Erickson and Hamilton 2001).

RED-LEGGED KITTIWAKE *Rissa brevirostris* (2, 1). A female, in at least in its third calendar year, was found in emaciated condition in a residential area of Ross, MRN, 13 Feb 2001 and died at a rehabilitation facility during the night of 13–14 Feb (RS†; #CAS 88973; 2001-066). It was actively growing its 9th primary (10th old). A photograph appears in NAB 55:248, 2001. California's only previous Red-legged Kittiwake was found under similar circumstances in Anaheim, ORA, 28 February 1996 (McCaskie and San Miguel 1999).

SOOTY TERN *Sterna fuscata* (8, 1). One 10.8 mi. WSW of Tomales Pt., MRN, 26 Aug 2001 (RS†; AD, TLE, GGr†, SHe†, CL, LML‡, DMacK†, BDP, EP†, JWh, JWi; 2001-184; Figure 6) was the first for California north of Ventura County, although there is a specimen record for Alaska (Dickerman et al. 1998).

LONG-BILLED MURRELET *Brachyramphus perdix* (11, 4). Single birds in basic (or first alternate?) plumage 0.5 km offshore 1 km s. of the Aptos Creek mouth, SCZ, 23 Aug 2001 (LHe†; 2001-179), off the Eel R. mouth, HUM, 11 Sep 2001 (EE‡; 2001-194), off the Little R. mouth, HUM, 21 Sep 2001 (EE‡; 2001-195), and 1 mi. ESE of Año Nuevo I., SM, 18 Oct 2001 (LHe†; 2001-175) were all found by persons monitoring Marbled Murrelets (*B. marmoratus*).

Figure 6. This adult or near adult Sooty Tern, *Sterna fuscata*, flew past an organized pelagic trip 10.8 miles west-southwest of Tomales Point, Marin Co., 26 August 2001, for northern California's first record.

Photo by Dave MacKenzie

RUDDY GROUND-DOVE *Columbina talpacoti* (73, 1). A male was at Galileo Hill Park, KER, 20–22 Oct 2001 (KL†, MSanM; 2001-204).

BROAD-BILLED HUMMINGBIRD *Cynanthus latirostris* (58, 1). A male was seen briefly but adequately described at Fort Rosecrans National Cemetery, Pt. Loma, SD, 22 Oct 2001 (REW; 2001-215).

GREATER PEWEE *Contopus pertinax* (35, 1). One at the Pomona Cemetery, Pomona, LA, 1 Dec 2001–28 Feb 2002 (ABL, CAM†, DPa†, DPe†, MSanM; 2001-209) fit the species' typical pattern of winter vagrancy.

YELLOW-BELLIED FLYCATCHER *Empidonax flaviventris* (14, 1). A juvenile was banded on Southeast Farallon I., SF, 4 Oct 2001 (JT; RDB†, KNN†; 2002-013; Figure 7).

DUSKY-CAPPED FLYCATCHER *Myiarchus tuberculifer* (64, 3). One was at Bodega Head, SON, 17 Nov 2001 (ERL; LML; 2001-197). One at Lakeside Park, Oakland, ALA, 16 Dec 2001–20 Jan 2002 (ME; CDL†, JM, DEQ; 2001-218) constituted the first record for Alameda County. Another was at Greenwood Cemetery, San Diego, SD, 15 Dec 2001–20 Apr 2002 (JOZ; ML, GMcC, CAM, JRO†, MSanM; 2001-221). These records fit the species' typical late-fall-and-winter pattern in California.

GREAT CRESTED FLYCATCHER *Myiarchus crinitus* (45, 2). One in Owl Canyon, Bodega Bay, SON, 5 Oct 2001 (DWN†, ERL; JM, BDP; 2001-185) was the first for Sonoma County. Another was at Fort Rosecrans National Cemetery, Point Loma, SD, 10–13 Oct 2001 (LMD†; GMcC, MPo†, GLR, REW†; 2001-171).

THICK-BILLED KINGBIRD *Tyrannus crassirostris* (15, 0). One returned to the campus of California State Polytechnic University, Pomona, LA, 1 Dec 2001–28 Feb

Figure 7. This Yellow-bellied Flycatcher, *Empidonax flaviventris*, was captured and banded on Southeast Farallon Island, 4 October 2001. Note the relatively uniform thin buffy eye ring typical of this species.

Photos by Kristie N. Nelson

Figure 8. This Blue-headed Vireo, *Vireo solitarius*, was captured and banded on Southeast Farallon Island 21 September 2001. The most notable features seen in these photographs include the blue-gray head constrasting with the greenish back, the bold white "spectacles," and the bold white throat constrasting sharply with the sides of the face.

Photos by Kristie N. Nelson

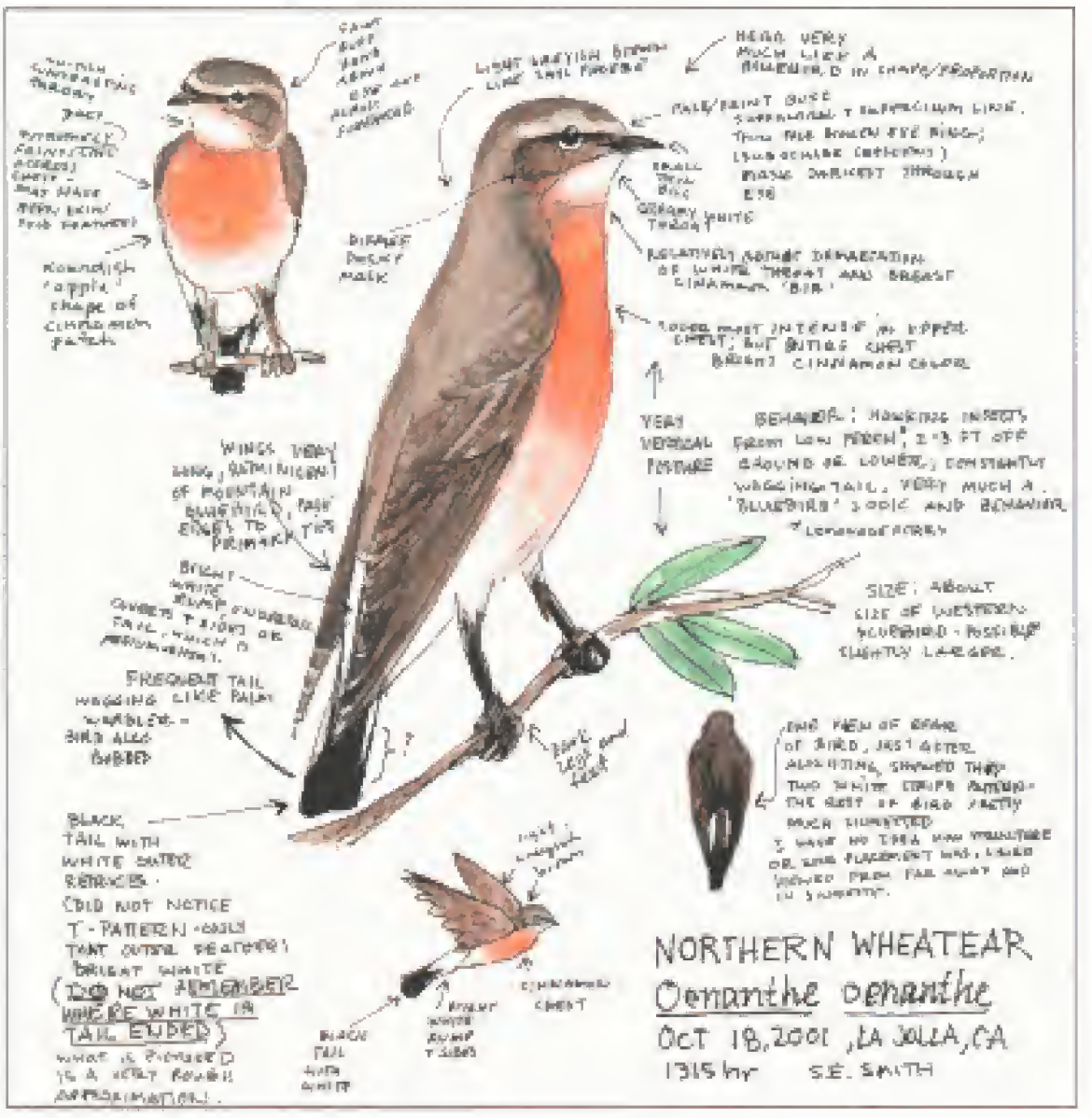

Figure 9. This Northern Wheatear, *Oenanthe oenanthe*, at the La Jolla Coastal Preserve, La Jolla, San Diego Co., 18 October 2001, was only the second ever for southern California.

Sketch by Susan E. Smith

2002 (MSanM; 2001-024) for its tenth consecutive (and apparently final) winter; it was not found during winter 2002–2003.

WHITE-EYED VIREO *Vireo griseus* (44, 4). One at Pescadero Creek, SM, 6 May 2001 (RST; 2001-127) made the earliest spring record for California. Singing birds were near Cajon Pass, SBE, 15–16 May 2001 (MSanM§; 2001-110), Big Sur R. mouth, MTY, 16 May 2001 (JWS; 2001-128), and Elk Head, Trinidad, HUM, 10–17 Jun 2001 (JCP, JAA; 2001-138).

YELLOW-THROATED VIREO *Vireo flavifrons* (84, 10). The year 2001 yielded an impressive ten records, equal only to the numbers seen in 1992; all birds (even the one in fall) were singing, and one can only guess how many silent birds went undetected. Individuals were at Coyote Creek in s. San Jose, SCL, 13–15 May 2001 (MJM; AME, MMR†; 2001-080) for a first county record, Laguna Niguel Regional Park, ORA, 14–17 May 2001 (MDe‡; RF; 2001-106), Pt. Reyes, MRN, 15 May

2001 (RS; JE, JPK; 2001-100), Jawbone Canyon, KER, 19–20 May 2001 (SBT; JCW; 2001-084), Big Sur R. mouth, MTY, 19 May 2001 (JM, RF; 2001-085), Lee Vining Creek, MNO, 24 May 2001 (KNN; 2001-121), Rancho Sierra Vista near Newbury Park, VEN, 28 May 2001 (SS; MPo; 2001-087), Butterbredt Springs, KER, 3 Jun 2001 (LC; 2001-116), and Pine Valley, SD, 11–16 Jun 2001 (MBM; PAG, GMcC; 2001-097). The fall record was of a bird at Big Sycamore Canyon, VEN, 7–8 Oct 2001 (MSanM; DPe†; 2001-203).

BLUE-HEADED VIREO *Vireo solitarius* (14, 4). One was on the Oxnard Plain, VEN, 11–18 Feb 2001 (DV; MSM; 2001-054). A fall migrant was banded on Southeast Farallon I., SF, 21 Sep 2001 (KNN†; AB; 2002-014; Figure 8), and others were at Shay Park, Arcata, HUM, 3–4 Oct 2001 (DFi; 2001-165) and Galileo Hill Park, KER, 22 Oct 2001 (TEW; MSanM†; 2001-205).

YELLOW-GREEN VIREO *Vireo flavoviridis* (74, 1). One was at Goleta, SBA, 7–8 Oct 2001 (DMC; RC, NL; 2001-169).

NORTHERN WHEATEAR *Oenanthe oenanthe* (11, 1). One at the La Jolla Coast Preserve in La Jolla, SD, 18 Oct 2001 (DAu, SES; GMcC, JOZ; 2001-177; Figure 9) was endorsed with a 9–1 vote. The dissenting member expressed concern that other wheatears, particularly the Isabelline (*O. isabellina*), were not ruled out. This is the first Northern Wheatear for San Diego County and only the second for southern California; all but one of California's records are from the period 15 Sep–10 Nov.

EYEBROWED THRUSH *Turdus obscurus* (1, 1). A male at Galileo Hill Park, KER, 28 May 2001 (SBT†, LST‡, JSe; RAE, JI, GMcC, BSt†; 2001-086) represented the first record for California of this Asiatic species. Its discovery in spring at this desert locale defies precedent, as virtually all vagrant Siberian breeders are recorded in fall and nearly always along the coast. In North America, this species occurs regularly in the Aleutian Is., primarily in spring, and has occurred casually in the Pribilof Is. and northern Alaska (AOU 1998). Given the spring date, this bird undoubtedly spent the previous winter somewhere in the Western Hemisphere.

RUFOUS-BACKED ROBIN *Turdus rufopalliatus* (10, 1). One was near Mayflower Park in Blythe, RIV, 11–14 Nov 2001 (GGr†, MJM, GMcC, MMR†, MSanM, ES; 2001-193).

*GRAY CATBIRD *Dumetella carolinensis* (110, 2). A bird found on San Nicolas I., VEN, 8 Nov 1998 (RDB; 1999-081) required four rounds before being accepted. Concerns focused on the rather sparse documentation that was not written at the time of observation. In the end nine members endorsed it. Another catbird was in Cabrillo National Monument, Point Loma, SD, 31 Oct 1999–21 Jan 2000 (GMcC; 2001-162). Records of this species after 1999 are not reviewed by the Committee.

BLUE-WINGED WARBLER *Vermivora pinus* (31, 2). One at California City, KER, 21 May 2001 (JLF; 2001-113) was accepted 9–1 with one Committee member concerned about discrepancies between the written description and the sketch. Another was at Galileo Hill Park, KER, 28 May 2001 (SBT; 2001-092).

GOLDEN-WINGED WARBLER *Vermivora chrysoptera* (66, 3). A second-year male was banded on Southeast Farallon Island, SF, 25 May 2001 (MG; CDelT†; 2001-130). A female was at Galileo Hill Park, KER, 13 Jun 2001 (KL; 2001-133). Another female was at the Orange County Fairgrounds, Costa Mesa, ORA, 30 Dec 2001–12 Jan 2002 (LDT; CAM, JM; MSanM; 2002-025).

BLUE-WINGED × GOLDEN-WINGED WARBLER (4, 1). A female photographed at Cabrillo National Monument, Pt. Loma, SD, 15–19 May 2001 (PAG; ABL, MMa†, GMcC, GLR; 2001-082; Figure 10) was submitted, but not accepted, as a Golden-winged (see "Records Not Accepted, Identification Not Established" below). At its

2003 meeting the Committee voted to accept it as belonging to this hybrid combination, with two members still supporting the identification as a "pure" Golden-winged.

YELLOW-THROATED WARBLER *Dendroica dominica* (90, 3). One near the intersection of Sequence Drive and Mira Mesa Boulevard, San Diego, SD, 24 Jan–21 Mar 2001 (TRC; GMcC, GLR, GCH; 2001-060) and one at Refugio State Beach, SBA, 12–26 May 2001 (JSt; HK, PK, RC, DMC; 2001-078) were both thought to be of the more frequently occurring subspecies *albilora*. The description of a bird in Solana Beach, SD, 24 Oct 2001 (PAG; 2001-190) suggested the yellow-lored race *dominica*.

GRACE'S WARBLER *Dendroica graciae* (36, 2). One was in Del Mar, SD, 9 Nov 2001 (EC; 2001-191). A first-winter female was at Fort Rosecrans National Cemetery, Point Loma, SD, 20 Sep 2001–20 Apr 2002 (GMcC; MJI, MPo†, REW†; 2001-153).

PINE WARBLER *Dendroica pinus* (63, 3). One was at Fort Rosecrans National Cemetery, Pt. Loma, SD, 4–6 Oct 2001 (REW†; GMcC; 2001-163). Another was on Southeast Farallon I., SF, 7 Oct 2001 (PP; RDB; 2002-016). One wintered in Santa Barbara, SBA, 30 Dec 2001–28 Feb 2002 (HPR; 2002-050).

WORM-EATING WARBLER *Helmitheros vermivorus* (92, 3). One at Butterbredt Springs, KER, 22–25 Apr 2001 (TEW; KL†; 2001-101) represented the earliest spring record for this species. One was at the Big Sur R. mouth, MTY, 19–20 Sep 2001 (JWS†; 2001-186). Another was on the University of California, Santa Barbara campus, Goleta, SBA, 30 Nov 2000–12 Jan 2001 (GW; LRB, DMC, NL, CAM, MSanM; 2001-207).

CONNECTICUT WARBLER *Oporornis agilis* (90, 5). One at Natural Bridges State Beach, SCZ, 1 Oct 2000 (AK; 2000-121) finally garnered the required nine votes in the third round. One found in weakened condition in Pacific Grove, MTY, 12 Sep 1998 was taken to the local S. P. C. A. shelter where it died on 17 Sep 1998 and was preserved as a live mount (EM†; #PGM2428; 2002-051). Another was at the Pt. Reyes lighthouse, MRN, 22 Sep 2001 (JLD; LML; 2001-212). Additional birds were at Galileo Hill Park, KER, 23 Sep 2001 (LCo‡; JSe; 2001-158) and on Southeast Farallon I., SF, 23 Sep–4 Oct 2001 (KNN†; AB†, PP; 2002-017; Figure 11).

MOURNING WARBLER *Oporornis philadelphia* (113, 4). Two records—of one at Harkins Slough, SCZ, 17 Jun 1998 (DLS; 1999-025) and one at California City, KER, 25 Sep 1999 (JLD; RF, MTH, GMcC, JM, MAP, GHR‡, JCW†; 1999-165; Figure 12)—required four and three rounds, respectively, to resolve, illustrating the difficulties the Committee sometimes encounters with this species. In the case of the latter record, the bird was seen by many experienced observers and was adequately documented with written descriptions, videotape, and photographs. Although it had several characteristics consistent with the Mourning Warbler (including call, long undertail coverts, and some yellow on the throat), considerable concern about the presence and relative thickness of eye-crescents caused many committee members to raise the possibility of its being a MacGillivray's Warbler (*O. tolmiei*) or perhaps a hybrid Mourning × MacGillivray's warbler. Subsequently, Heindel (in comments) suggested that the eye-crescents on the bird were within the range of variation known in Mourning Warbler, and specimen photographs provided by Gary H. Rosenberg further demonstrated this point. Additionally, the late inclusion of a videotape had audio of the bird's call, which was thought to be diagnostic of Mourning Warbler. Two more Mourning Warblers were on Southeast Farallon I., SF: 4–5 Oct 2001 (KNN†; 2002-019) and 7 Oct 2001 (PP†; 2002-018).

SCARLET TANAGER *Piranga olivacea* (115, 12). Twelve birds recorded in 2001 were more than in any previous year, exceeding the previous record of nine in 1987;

Figure 10. Golden-winged × Blue-winged Warbler, *Vermivora chrysoptera* × *V. pinus*, at Point Loma, San Diego Co., 19 May 2001. Note the fairly extensive yellow on the breast and belly of this female, indicating a hybrid.

Photo by Matthew Matthiessen

all records were from the southern half of the state. Males were in California City, KER, 11 May 2001 (JCW; 2001-111); at Montana de Oro State Park campground, SLO, 30 May 2001 (MDS; 2001-090); and at Live Oak, SCZ, 27 Jun 2001 (DLS; 2001-141). Single birds were at Fort Rosecrans National Cemetery, Point Loma, SD, 9 Oct 2001 (JWo, GMcC; 2001-170), 22–28 Oct 2001 (GCH; DWA†, LHu, GMcC; 2001-181), and 29 Oct–10 Nov 2001 (JWo; MUE; 2001-200), and another was in a nearby residential area 27–28 Oct 2001 (GMcC; SES; 2001-183; Figure 13). Additionally, single birds were at Laguna Grande Park, Seaside, MTY, 14–17 Oct 2001 (AC; BH†; 2001-156); La Jolla, SD, 19 Oct 2001 (PAG; 2001-178); San Clemente I., LA, 26 Oct 2001 (BLS; 2002-029); Goleta, SBA, 14–17 Nov 2001 (DMC, PG†, PK; 2001-196); and Oceano Campground, Oceano, SLO, 28–29 Nov 2001 (KJZ; 2001-219).

CASSIN'S SPARROW *Aimophila cassinii* (45, 4). Singing birds were noted in Chiquita Canyon near San Juan Capistrano, ORA, 1–4 Jun 2001 (DRW; 2001-118), in Upper Grasshopper Canyon near Castaic, LA, 8 Jun 2001 (BEDa; MSanM; 2001-112), and in Weldon, KER, 10–13 Jun 2001 (BB; JCW; 2001-135); the last two provided the first records for Los Angeles and Kern counties, respectively. One on San Clemente I., LA, 2 Nov 2001 (BLS†, SL, JHP; 2001-192; Figure 14) was only the ninth recorded in California in fall. Interestingly, all other fall records are from Southeast Farallon I., SF.

SMITH'S LONGSPUR *Calcarius pictus* (6, 1). One with Lapland (*C. lapponicus*) and Chestnut-collared (*C. ornatus*) longspurs near Calipatria, IMP, 31 Dec 2001–16 Jan 2002 (TE; GCH, GMcC; 2002-002) was the first for Imperial County and the first to be found in winter in California.

SNOW BUNTING *Plectrophenax nivalis* (71, 1). One of indeterminate age and sex was at Montgomery Creek Ranch near Benton, MNO, 10–11 Feb 2001 (DH; CB; 2001-059).

Figure 11. This Connecticut Warbler, *Oporornis agilis*, was captured and banded on Southeast Farallon Island, 23 September 2001.

Photo by Kristie N. Nelson

Figure 12. The relative thickness of the eye crescents on this Mourning Warbler, *Oporornis philadelphia*, photographed in California City, Kern Co., 25 September 1999, proved to be somewhat problematic for the committee. The calls of this bird, heard on the audio portion of a videotape, helped establish its identification.

Photo by John C. Wilson

PAINTED BUNTING *Passerina ciris* (88, 7). An adult male at Furnace Creek Ranch, INY, 26–27 May 2000 (MJSM; 2000-086) required three rounds to gain acceptance, as records of spring males generate concern about natural origin. A immature banded at Coyote Creek Field Station, Alviso, SCL, 30 Sep 2000 (RiC†; 2002-129) was a first for Santa Clara County. A green bird visiting a feeder in Encinitas, SD, 21–22 Oct 2000 (KA; SW; 2000-146) and a female at Cabrillo National Monument, Pt. Loma, SD, 16 May 2001 (GCH; ABL; 2001-083) also raised concerns about natural occurrence; both records went two circulations before acceptance. Additionally, individuals were in Bishop, INY, 22 Aug 2001 (DPa; 2002-030), at the Big Sur R. mouth, MTY, 5 Sep 2001 (JWS†; 2001-187), and Natural Bridges SB, SCZ, 4–6 Oct 2000 (SGe; TME, JG; 2002-022). The four accepted records for 2000 bring to 13 the number of accepted records for that year.

COMMON GRACKLE *Quiscalus quiscula* (54, 3). Birds were at Sepulveda Dam Recreation Area, Encino, LA, 24 May–*11 Jun* 2001 (KLG†; 2001-094; Figure 15), in Guerneville, SON, 23 Dec 2001–20 Jan 2002 (PP†; KMB, LWC, CDL†, JM, BDP, DEQ, RS†; 2001-227), and near Rovana, INY, 15–18 Dec 2001 (JLD; 2002-043).

RECORDS NOT ACCEPTED, IDENTIFICATION NOT ESTABLISHED

YELLOW-BILLED LOON *Gavia adamsii*. A large, pale loon at Manila Park, Humboldt Bay, HUM, 13 Dec 2001(2002-052) was thought by many Committee members to likely have been a Yellow-billed, but lack of details on bill color and head pattern led a majority to consider the identification not established.

MANX SHEARWATER *Puffinus puffinus*. One was reported with Sooty Shearwaters (*P. griseus*) from shore at the Salinas River mouth, MTY, 20 Sep 2001 (2001-157), but the brevity of the observation and incomplete description led Committee members to consider the identification only probable.

RED-TAILED TROPICBIRD *Phaethon rubricauda*. One was reported from a low flying Partenavia P-68 Observer aircraft, a twin-engine wing-over plane used for marine-mammal surveys, at 32° 24′ N, 120° 40′ W off Ventura County 14 Aug 1998 (1998-159). The record generated much discussion of the efficacy of identifying birds from aircraft, leading to a consensus that identification can often be straightforward once observers adjust to the dramatic change in viewing angle. Ultimately, however, concerns about the described dorsal pattern and the bird's flight characteristics led to the record's rejection.

GLOSSY IBIS *Plegadis falcinellus*. One at Twentynine Palms, SBE, 29–31 Aug 1999 (1999-143) would have been California's first (Patten and Lasley 2000). The bird's age was uncertain, but it was likely in its first or second calendar year. The distant photographs showed no diagnostic characters, and some Committee members were uneasy about applying the well-described facial pattern to immature birds.

TRUMPETER SWAN *Cygnus buccinator*. A report of "perhaps four or five adults and juveniles" at Yuba City, SUT, 22 Jan 2001 (2001-021) received no support.

AMERICAN OYSTERCATCHER *Haematopus palliatus*. One seen in flight at Newport Beach, ORA, 6 Feb 1999 (1999-065) showed some influence of the Black Oystercatcher and was considered a possible hybrid by half the Committee members. One at Eel Pt. on San Clemente I., LA, 24 Apr 2001 (2001-114) was seen too briefly for several characters to be noted, and a hybrid Black × American Oystercatcher could not be ruled out.

WOOD SANDPIPER *Tringa glareola*. The report of one at Blythe, RIV, 1 Sep 2001 (2001-150) was intriguing, yet another of a species considered overdue in California. Although most Committee members believed the bird was likely a Wood

Sandpiper, the level of documentation was not high enough for acceptance of a first state record by a single observer.

GRAY-TAILED TATTLER *Heteroscelus brevipes*. The report of one at Kehoe Beach, Pt. Reyes, MRN, 24–26 May 1998 (1998-099) was one of the more difficult the Committee has dealt with. Described and sketched in detail by careful and experienced observers, the bird nevertheless generated considerable debate on calls and morphological characters. The calls heard did not include the typical disyllabic note of the Gray-tailed but a mellow whistled series, recalling a Lesser Yellowlegs (*Tringa flavipes*). Ultimately members accepted that the call could fit a Gray-tailed, but some were not convinced it ruled out a Wandering Tattler (*H. incanus*). Problems with assessment of the maxillary groove and with some plumage characters led to the record's falling barely short of acceptance (it received eight accept votes on the 3rd and 4th rounds). There remains only one accepted record for California.

LITTLE GULL *Larus minutus*. One at Dockweiler State Beach, El Segundo, LA, 12 Jan 2001 (2001-038) was described as "all white," ruling out the claimed species.

RED-LEGGED KITTIWAKE *Rissa brevirostris*. Experienced observers reported one on the water with three Black-legged Kittiwakes (*R. tridactyla*) 7 miles w. of Davenport, SCZ, 26 Feb 2001 (2001-095). Several important characters (including leg/foot color) were not noted, and the bird was not observed in flight. Although most described features were highly suggestive of the claimed species, some members felt that the description did not satisfactorily eliminate the Mew Gull (*Larus canus brachyrhynchus*).

GREATER PEWEE *Contopus pertinax*. One reported from Julia Pfeiffer Burns State Park, MTY, 15 Apr 2001 (2001-075) was unanimously not accepted as members felt the details were inadequate to support what would be the first record of a spring vagrant for the state. Except for a dozen wintering birds lingering until March or April, there are no accepted spring records for this bird in California.

ALDER FLYCATCHER *Empidonax alnorum*. One banded and photographed on Southeast Farallon I., SF, 21 Aug 1991 (1993-101) was re-evaluated by the Committee after failing to gain acceptance in 1994; see discussion by McKee and Erickson (2002). After reasonable support in the first round, the record was not accepted in the second round 1–9 with most committee members concluding that the bird was quite possibly an Alder Flycatcher but unconvinced that the eastern subspecies of the Willow Flycatcher (*E. t. campestris/traillii*) was ruled out. There remain just four accepted records for the Alder Flycatcher in California.

DUSKY-CAPPED FLYCATCHER *Myiarchus tuberculifer*. Most Committee members found the description of one at the Ventura Game Preserve near Port Hueneme, VEN, 29 May 2001 (2001-096) inadequate in view of this unprecedented late date; it received only one lukewarm endorsement.

BLUE-HEADED VIREO *Vireo solitarius*. One at Pescadero Creek, SM, 2 Jan 1999 (1999-087) received an 8–2 vote in its first round with both dissenting members concerned that the description of "thin greenish edgings" to the rectrices would be better for Cassin's Vireo (*V. cassinii*). While most members felt that there was a possibility the bird seen was indeed a Blue-headed Vireo, by the fourth round support had waned and the record was not accepted 3–7. The multiple descriptions of a singing bird reported at Galileo Hill Park, KER, 2–3 Jun 2001 (2001-091) were, in the opinion of all Committee members, not exclusive of Cassin's Vireo. Disappointing to several Committee members was the fact that this bird was videotaped, yet only inconclusive video-captured photographs were submitted. While the described song of the bird was intriguing to several members, it was not enough to garner support for this record. One seen at Fort Rosecrans National Cemetery on Point Loma, SD, 11 Sep 2001 (2001-214) received no support, the Committee believing that the rather

Figure 13. Scarlet Tanager, *Piranga olivacea*, 27–28 October 2001, Point Loma, San Diego Co. This sketch represents one of 12 Scarlet Tanagers recorded in California in 2001.

Sketch by Susan E. Smith

Figure 14. This Cassin's Sparrow, *Aimophila cassinii*, photographed on San Clemente Island, Los Angeles Co., 2 November 2001, was only the ninth recorded in California in fall.

Photo by Brian L. Sullivan

Figure 15. This Common Grackle, *Quiscalus quiscula*, was photographed in the Sepulveda Basin, Los Angeles Co., 9 June 2001.

Photo by Kimball L. Garrett

brief and incomplete views were insufficient for distinguishing birds of this complex. Another in Blythe, RIV, 30 Sep 2001 (2001-224) was thought possibly to pertain to the Blue-headed Vireo, but in the opinion of most Committee members the rather brief description did not eliminate Cassin's Vireo. One in La Jolla, SD, 6 Oct 2001 (2001-208) was thought by all members to be too briefly seen, with written details too perfunctory to eliminate Cassin's Vireo. Heindel (1996) provided detailed information on this difficult-to-identify complex.

CURVE-BILLED THRASHER *Toxostoma curvirostre*. Most Committee members felt the described call of a bird found in Mayflower Park, Blythe, RIV, 22–23 Nov 2001 (2001-223) was good for this species but that the documentation did not eliminate other thrasher species, including Bendire's (*T. bendirei*) and Le Conte's (*T. lecontei*).

GOLDEN-WINGED WARBLER *Vermivora chrysoptera*. When considered initially, a female photographed at Cabrillo National Monument on Pt. Loma, SD, 15–19 May 2001 (2001-082) received a vote of 8–2 in favor of acceptance. But both Dunn and Morlan expressed concern in first-round comments that there was perhaps too much yellow on the breast of this bird, precluding it from being a pure Golden-winged Warbler. The record was recirculated and was not accepted 2–8 in the second round. Golden-winged Warblers frequently hybridize with the closely related Blue-winged, and back-crosses between hybrids and pure birds are common. This bird was clearly not a first-generation hybrid, but perhaps some subsequent back-cross phenotypically most similar to a Golden-winged. At its 2003 meeting, the Committee unanimously voted to accept this bird as a Golden-winged × Blue-winged Warbler, the fourth accepted of this combination in California. Parkes (1951) and Dunn and Garrett (1997) reviewed hybridization of these two species.

CONNECTICUT WARBLER *Oporornis agilis*. One at Galileo Hill Park, KER, 15 Sep 2001 (2001-154) received no support, in part because of the described bill color (blackish) and the lores' being slightly blacker than the hood color, characters wrong for this species. The bird was apparently fairly active, yet the characteristic walking behavior was not noted. The described complete whitish eye-ring was helpful, but the Committee was not comfortable with the rest of the description.

MOURNING WARBLER *Oporornis philadelphia*. One measured and banded on Southeast Farallon I., SF, 13 Jun 1998 (1999-015) was almost certainly correctly identified, but there was never any written description of the bird. After four rounds the committee was split, with the dissenting members believing written documentation was essential for acceptance.

SCARLET TANAGER *Piranga olivacea*. After two rounds the Committee was unanimous that the rather brief description of a bird on Southeast Farallon I., SF 21 Jun 2001 (2001-131) did not rule out a Summer Tanager (*P. rubra*). Several members were also concerned about the described five-note vocalization that was not consistent with their experiences with the Scarlet and better for the Summer.

VARIED BUNTING *Passerina versicolor*. A report of one seen briefly at the Salton Sea National Wildlife Refuge, IMP, 12 May 2001 (2001-081) split the committee in the first round. Comments included concern about the described overall color ("Blue Jay" blue, not purplish) and nape color (chestnut, not red), as well as the brevity of the sighting. The Committee was unanimous in the second round. There remain only two accepted records of this species in California.

RECORDS NOT ACCEPTED, NATURAL OCCURRENCE QUESTIONABLE (IDENTIFICATION ACCEPTED)

NAZCA BOOBY *Sula granti*. An immature that landed on a sport-fishing boat in Mexican waters at 117° 45' W, 31° 45' N (about 60 n. miles sw. of Pt. Loma SD, or 50 n. miles w. of Punta Banda, Baja California), 27 May 2001, remained on that boat into San Diego, and was taken into care by Project Wildlife after being captured on 29 May (GMcC†, REW†; 2001-107; Figure 16). Identification was accepted on the basis of some acquisition of orange adult bill color and, importantly, through a genetic analysis in the laboratory of Vicki L. Friesen at Queen's University in Kingston, Ontario, Canada (T. E. Steeves, in litt.; Friesen at al. 2002). The Committee's deliberations centered on the acceptability of records of ship-transported birds and the extent to which the bird might have been induced to remain on the boat by being fed; the record ultimately only received one vote to accept. By a vote at the January 2003 meeting, this species was placed on the state's Supplemental List.

HARRIS'S HAWK *Parabuteo unicinctus*. One was at Tinemaha Res., INY, 9 Jul 1999 (TH†; 2000-004). The only record that has been accepted after the 1994–96 incursion of these hawks into southern California (Patten and Erickson 2000) was of two or three birds near Indio, RIV, 11–27 Nov 1999 (Rogers and Jaramillo 2002). The Harris's Hawk at Tinemaha Res. was somewhat farther removed from the earlier incursion both temporally and geographically, and half of the Committee questioned its natural occurrence.

PYRRHULOXIA *Cardinalis sinuatus*. A female in Costa Mesa, ORA, 7 Feb–13 Mar 1999 (RAH, GMcC, JM, EGS, JWe†; 1999-078) generated lively (and sometimes heated) comments about the probability of natural occurrence through four equally split rounds. In summary, in spite of three records accepted by the CBRC fitting a "coastal pattern," dissenters did not feel comfortable with this bird's urban location and the fact that this species is commonly held and sold in captivity in

Figure 16. This Nazca Booby, *Sula granti*, came aboard a fishing boat in Mexican waters about 60 miles southwest of San Diego, San Diego Co., riding the boat into San Diego Bay. This photograph was taken in captivity at Project Wildlife, San Diego, 2 June 2001.

Photo by Richard E. Webster

southern California (Hamilton, in comments). Supporters argued that this species is prone to wander and Dunn (in comments) cited its apparent increase in numbers and distribution in southeastern Arizona in winter, as well as recent records of winter and spring vagrants elsewhere in the Southwest. This record exemplifies the difficulties the Committee has in attempting to determine natural occurrence in vagrants.

PAINTED BUNTING *Passerina ciris*. An adult male in the Tijuana River Valley, SD, 16–23 Nov 2001 (GMcC; MUE; 2001-198) received only four votes for acceptance, as the majority of Committee members remain cautious about adult males found adjacent to Tijuana, Mexico, where both males and females are commonly sold. An adult male at a feeder in La Mesa, SD, 15 Feb 2001 (LL†; 2001-058) failed to get any support as all members were skeptical of the origin of an adult male in mid-winter visiting a feeder in an urban setting so close to the Mexican border. Most members took a conservative approach about two green individuals found in winter. One in the Tijuana R. Valley, SD, 29 Dec 2001 (GMcC; 2001-226) and one at a feeder in Dana Point, ORA, 12 Jan 2001 (DaG; 2001-077) each managed just three votes to accept. Because of the Committee's prevailing views on natural occurrence, there remain no accepted winter records for this species in California.

BLACK-BACKED ORIOLE *Icterus abeillei*. An adult male at Smuggler's Gulch on the south side of the Tijuana River valley, SD, 9 Apr–1 Jul 2000 (JEH; MDe†, JLD, PAG, SHa, GCH†, GMcC, JM, DN†, HLP, MPa, DEQ, MSanM, DS†; 2000-073) and returning 28 Apr–4 Jul 2001 (AME; DVB†, CAM, GMcC, MJM, MAP, MMR; 2001-074) was associating with nesting Bullock's Orioles *Icterus bullockii*, apparently arriving and departing with them, and eventually enjoyed the full support of the

Committee. The discovery of the bird at the same locale 2–13 Jan 2002 (CGE, GMcC, CHR; 2002-020) caused most members to adopt a more conservative position, because the bird had not migrated south with Bullock's Orioles. Ultimately, both this winter record and the records from 2000 and 2001 were not accepted 2–8. There are no records for this Mexican endemic in the United States (Jaramillo and Burke 1999).

ADDENDUM AND CORRIGENDA

The following corrections pertain to the 26th report of the CBRC (McKee and Erickson 2002). The Shy Albatross (record 2000-129) in Figure 1 was photographed on 10 Sep 2000 (not 2002 as indicated in the caption); the date in the text is correct. Peter Famolaro was inadvertently omitted as the original observer of the White-eyed Vireo along the Sweetwater River in the Otay–Sweetwater Unit of San Diego N.W.R., Spring Valley, SD, 5–15 Jul 2002 (2000-108). Under "Records Not Accepted, Identification Not Established", the correct record number for the Arctic Loon is 2000-040.

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ACKNOWLEDGMENTS

We are grateful to the numerous observers who contributed records, accepted or not, cited in this report. Important assistance to the Committee was provided by Bruce G. Peterjohn, who analyzed Glossy Ibis records, Tammy E. Steeves of Queen's University in Kingston, Ontario, who ran a genetic analysis of feathers plucked from the Nazca Booby, and Geoff Carey, Erik Hirschfeld, Trevor Hardaker, Richard Millington, Olli Tenovvo, and Koen Verbanck, who provided extensive comments on the Greater Sand-Plover. A draft of this report was reviewed and improved by Luke W. Cole, Jon L. Dunn, Richard A. Erickson, Guy McCaskie, Tristan McKee, Joseph Morlan, Peter Pyle, Michael M. Rogers, Mike San Miguel, and John C. Sterling. We thank Peg Stevens, Jon Fisher, and Linnea Hall of the Western Foundation of Vertebrate Zoology for their continued support in the housing and curation of the Committee's archives.

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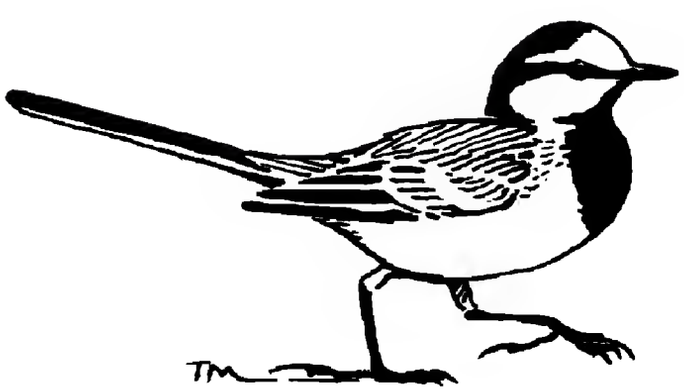
Accepted 3 March 2003



NOTES

BEHAVIORAL NOTES ON SOME BREEDING BIRDS IN SOUTHERN UTAH

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Rare, or rarely observed, behaviors may represent important components of a species' life history and may provide valuable insight into the evolution and maintenance of behavioral traits. Rare behaviors, however, frequently go undocumented, limiting our ability to evaluate fully the distribution of behavioral traits within a species' repertoire or among related species. Understanding the frequency of events or traits that have consequences for a bird's fitness may elucidate its evolution. Here I describe three apparently rare behaviors, observed in high-elevation breeding passerines, that have been reported only once or never previously in the literature. In particular, I document reuse of a nest site by Western Wood-Pewees (*Contopus sordidulus*), nest building by a juvenile American Robin (*Turdus migratorius*), and helping behavior in Chipping Sparrows (*Spizella passerina*).

Observations were made in mixed conifer–aspen forest along Duck Creek, 0.1–1.0 km east of Duck Lake, Dixie National Forest, Kane Co., Utah, at an elevation of 2575 m. Habitat consisted primarily of regenerating trembling aspen (*Populus tremuloides*) woodland with scattered large aspen, Engelmann spruce (*Picea engelmanni*), and ponderosa pine (*Pinus ponderosa*) trees. Information presented here was obtained as I surveyed an area of about 34 ha one to two times per week from May to August 2000–2001, as part of a larger project on the breeding biology of the Dusky Flycatcher (*Empidonax oberholseri*).

Nest and substrate heights that were too high to be measured directly were calculated from measurements made with a clinometer.

Nest site reuse in the Western Wood-Pewee. I observed an active Western Wood-Pewee nest in the same nest site during the breeding seasons of both 2000 and 2001. The fates of these nests were not determined. The reused nest site consisted of a small shelf, which appeared to be the scarred base of a broken-off branch, 5.0 m above the ground. The nest was built against the main trunk of a live trembling aspen, 9.7 m tall. On the basis of six other nests, Western Wood-Pewees in the study area tend to use two types of nest sites: small shelves (e.g., broken-off branch scars) adjacent to the trunks of live aspen trees (n = 3), and small dead aspen branches, 5–50 cm from the main trunks of live aspen trees (n = 3). Considering all Western Wood-Pewee nest sites observed in the study area (n = 7), mean [± standard deviation (SD)] nest height was 3.6 ± 1.2 m (range 2.4–5.5 m) and mean nest tree height was 8.8 ± 2.5 m (range 4.4–12.7 m). Thus nest height, nest tree height, and vegetation characteristics of the reused nest site were not atypical of those observed for Western Wood-Pewees in the study area.

Despite being a common and widespread species in western North America, the breeding biology of the Western Wood-Pewee is rather poorly known (Chace et al. 1997). Reuse of nest sites, while apparently very rare among noncolonial passerines, occurs regularly in some tyrannid flycatchers and was recently documented in Western Wood-Pewees in New Mexico (Curson et al. 1996 and references therein). My observations from Utah suggest that this behavior may be widespread and relatively common in the Western Wood-Pewee.

Nest building by a juvenile American Robin. During the 2000 breeding season, American Robin fledglings were first seen in the study area on 31 May. On 16 June 2000, along the bank of Duck Creek, I observed an American Robin in juvenal plumage (characterized by heavy dark mottling on a buff-colored breast) collecting large, coarse, wet grasses. The juvenile robin carried that material, and similar

material collected during subsequent forays, to a mostly complete nest 9.2 m above the ground, on a branch of an Engelmann spruce 21.0 m tall. The nest was located approximately 2.0 m from the trunk and 0.8 m from the end of the branch. Between two of the three observed trips to the nest, the juvenile interacted nonaggressively with two adult American Robins, which were foraging within 30 m of the nest tree. Any relationship among the three birds is speculative. The adults were not observed collecting or carrying nesting material and were never observed near the nest. It is not known whether the juvenile bird constructed the entire nest. The nest site was unusually high in comparison to other American Robin nests observed in the study area (mean ± SD = 2.4 ± 1.3 m; range 0.5–4.3 m; n = 10). I did not observe any activity at the nest during subsequent days and weeks.

This is the second documented observation of nest building by a juvenile American Robin (see also Rasmussen 1986), although nonfunctional reproductive behavior is not exceptionally rare in young birds of this species. Juvenile American Robins have been observed copulating (Young 1955), incubating (D'Agostino et al. 1982), and feeding nestlings (Favell in Nice 1943). Brackbill (1973) observed a juvenile American Robin collecting nest material in August, although the bird was not observed carrying the material more than "several steps." Rasmussen (1986) observed an American Robin in fresh juvenal plumage nest building at a previously constructed American Robin nest, which was inactive after being depredated six weeks previously. At that nest, the juvenile bird performed nest-cup-shaping movements and manipulated, with its bill, nest material that was already in the nest (Rasmussen 1986). My observation represents a documented case of a juvenile American Robin, and one of few cases of any juvenile passerine, actively nest building with material that it collected and carried to a nest site in the wild.

Helping behavior in Chipping Sparrows. On 9 July 2000 I observed three adult Chipping Sparrows feeding at least two nestlings 7–9 days old (nestling age based on development of young on 9 July, a 9–12-day nestling period [Middleton 1998], and a fledging date of 12–14 July) at a nest located 3–4 m above the ground in an Engelmann spruce 5–6 m tall. On 14 July, the three adults were observed carrying food to at least two fledglings at and in the vicinity of the nest. The fledglings were not together but were within 15 m of each other, with one perched on the same branch as, and within 20 cm of, the nest, and the other in a different tree within 15 m of the nest. It is possible that a third young bird was present on both 9 July (in the nest) and 14 July (near the nest). All three adults appeared to make multiple visits to the nest with food, but, because the birds were not banded, I could not discern if some visited the nest more or less frequently than others. On both days of observation, I saw all three adults, with food, in the same field of view as they visited the nest (9 July) and nest area (14 July).

This is apparently the first documented record of helping behavior in the western subspecies of the Chipping Sparrow (*Spizella passerina arizonae*). Although few records exist, helping behavior may be relatively widespread among *Spizella* sparrows, with one record each for the eastern subspecies of Chipping Sparrow (*S. p. passerina*) (Middleton and Prescott 1989, Middleton 1998) and for Brewer's Sparrow (*S. breweri*) (Gill and Krannitz 1997). The importance of helping behavior in the reproductive ecology of Chipping Sparrows will only be determined with detailed observational study of breeding populations.

I thank Priscilla Summers for her support of my work in the Dixie National Forest.

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Accepted 15 February 2003

APPARENT DEPREDATION OF CHESTNUT-COLLARED LONGSPUR NESTLINGS BY THE BROWN-HEADED COWBIRD

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The Brown-headed Cowbird (*Molothrus ater*) is an obligate brood parasite that lays eggs in the nests of more than 220 host species (Lowther 1993). Brown-headed Cowbirds typically reduce the reproductive success of their hosts by removing host eggs and producing nestlings that demand extensive care by host parents. Additionally, cowbird eggs require a shorter incubation period than the eggs of many host species (e.g., Briskie and Sealy 1990, Kattan 1995), and incubation of cowbird eggs may disrupt incubation of host eggs (McMaster and Sealy 1998). To parasitize a nest successfully, cowbirds must lay eggs in a host's nest when the host female is laying (or shortly thereafter, if cowbird eggs require a shorter incubation period than host eggs). However, some cowbirds also depredate nests much later in the nesting cycle, presumably to induce renesting (Smith and Arcese 1994, Arcese et al. 1996).

Depredation of hosts' eggs by cowbirds may include ejecting eggs from nests and sometimes eating eggs (Scott et al. 1992), puncturing eggs (which appears to function in assessment of egg development in the Shiny Cowbird, *Molothrus bonariensis*; Massoni and Roboreda 1999), or killing nestlings. Although accounts of depredation of nestlings by Brown-headed Cowbirds are rare, evidence indicates that this phenomenon has occurred in a variety of species (Dubois 1956, Tate 1967, Beane and Alford 1990, Scott and McKinney 1994, Grzybowski 1995, Sheppard 1996, Elliott 1999, Thompson et al. 1999, Granfors et al. 2001).

Here we report evidence for removal of Chestnut-collared Longspur (*Calcarius ornatus*) nestlings by a female Brown-headed Cowbird. These observations were made during a study of reproductive biology of a population of Chestnut-collared Longspurs at Benton Lake National Wildlife Refuge (BLNWR) in Cascade County, Montana (47° 40′ N, 111° 27′ W) from April to August in 1997 and 1998 and April to July in 1999 and 2000. As part of a long-term behavioral study (see Lynn et al. 2002), all individuals were banded with an aluminum U.S. Fish and Wildlife Service band and colored plastic leg bands for identification. We monitored all nests daily and assessed parental behavior during the nestling stage. Adults were captured at their nests with clap nets, which cover a 2.5 m × 7 m area of prairie when they are sprung.

Chestnut-collared Longspurs are infrequently parasitized by Brown-headed cowbirds (Hill and Gould 1997). In our study population, we found cowbird eggs in four (12.5%) of 32 Chestnut-collared longspur nests containing eggs in 1999. This was the only brood parasitism noted among 142 longspur nests monitored during incubation over four years at BLNWR (2.8% of nests parasitized). Brown-headed cowbirds are uncommon at BLNWR (U.S. Fish and Wildlife Service 1993).

On 11 June 1999, we conducted routine behavioral observations at a nest containing four two-day old nestlings. After 25 minutes of nest observation, both adults hovered near the nest and swooped into the grass, typical of nest defense from a ground predator (Hill and Gould 1997; Lynn pers. obs.). After 3 minutes, both the male and female left the territory. Several minutes later, a female cowbird flushed from the nest area. All four nestlings had been pulled from the nest; one had a laceration on the back of its neck, and all others were intact. We returned the nestlings to the nest cup, and the parents resumed feeding them. Five days later, we used a clap net at the same nest to capture the female longspur. When the net was sprung, we captured a

female cowbird as well as the female longspur. In four years of capturing adult longspurs at their nests, this is the only incident in which we captured a bird other than the parental male or female.

On 8 June 1999, while checking another Chestnut-collared Longspur nest with a brood of three six-day old nestlings, we discovered all three nestlings alive and unharmed, but scattered within 15 cm of the nest. We returned the nestlings to the nest, and the adults eventually resumed feeding. Approximately 5 minutes later, we observed both the male and female hovering and making low swooping flights near the nest. About 1 minute later, a female cowbird flushed from the nest area. After several minutes of attacking by the longspurs the cowbird flew away without removing nestlings. We did not observe a cowbird approaching this nest again.

We also found five-day old nestlings scattered outside of two other Chestnut-collared Longspur nests on 7 and 13 June 1999. At both nests, all nestlings were intact, but part of the brood had died, presumably as a result of desiccation or exposure. Although we did not observe a cowbird at these two nests, the circumstances of the previous accounts suggest that a cowbird may have been responsible.

An alternative explanation for finding nestlings outside of their nests at all of the nests we have described is infanticide by a replacement male (or female) following divorce of the parental male and female or death of one parent (see Rohwer et al. 1999 for a review), but this can be ruled out, as all of our birds were color banded and all pairs remained stable. Another possibility is that the nestlings fledged early; however, fledging usually occurs on day 10 after hatching (Hill and Gould 1997; Lynn pers obs.), and the oldest of the nestlings found outside of the nest cup were six days old. Additionally, at least one nestling suffered a laceration. Thus, it is clear that the nestlings were removed from their nests, and our observations strongly suggest that a female cowbird was responsible.

Except for the instances described here, we have not found intact nestlings, alive or dead, scattered outside of their nests at the other 138 nests we monitored at this study site. Thus our observations were not likely due to depredation attempts by common nest predators or to brood reduction. Common predators on Chestnut-collared Longspur nests include Richardson's Ground Squirrels (*Spermophilus richardsonii*), garter snakes (*Thamnophis* spp.), Northern Harriers (*Circus cyaneus*), Short-eared Owls (*Asio flammeus*), and Short-tailed Weasels (*Mustela erminea*, Lynn et al. 2002). These data suggest that depredation of nestlings by cowbirds is generally uncommon in our study population. It is, however, possible that on other occasions another predator may have consumed nestlings pulled from a nest by a cowbird, leading us to underestimate cowbird depredation rates. However, we usually either witnessed depredation directly, or the condition of the nest following depredation suggested predators other than cowbirds were responsible (e.g., nesting was material torn out of many nests, suggesting a mammalian predator, and owl pellets were found near other nests).

It is reasonable to assume that nestlings would have died if we had not replaced them in their nests and that, consequently, adults would have initiated renesting. Indeed, at two of nests described here, nestlings that were pulled from their nests did die. Our observations of a cowbird returning to two nests suggest the cowbird(s) may have monitored the success of their nestling removal. Parasitizing nests late in the incubation phase is clearly unproductive for cowbirds, whereas depredating nestlings facilitates parasitism by inducing renesting (Arcese et al. 1996). Chestnut-collared Longspur nests may be easier to locate during incubation because females often do not stay near the nest until they begin incubating (Lynn pers. obs.). In summary, our observations provide circumstantial evidence that cowbirds removed nestlings from Chestnut-collared Longspur nests and that cowbirds monitored specific nest sites after a depredation attempt.

NOTES

We thank the staff of BLNWR for assistance with multiple aspects of the Chestnut-collared Longspur study. Sievert Rohwer, Brian Walker, and an anonymous reviewer provided helpful comments on earlier drafts.

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Accepted 20 November 2002

BOOK REVIEWS

Wrens, Dippers and Thrashers, by David Brewer, illustrated by Barry MacKay. 2001. Yale University Press, New Haven and London. 272 pages, 32 color plates, numerous maps. Hardback, $50.00. ISBN 0-300-09059-5.

At that infamous (and apocryphal) meeting in some unnamed British pub a couple of decades back, when the bird families were being divvied up for a series of "identification guides" that would change the birding world as we knew it, somebody wandered in late and got a hodgepodge of little gray and brown birds as his assignment. Without any clear ecological or phylogenetic ties binding the three families that are the subject of this book, the treatment here smacks of this sort of historical accident. Nevertheless, there are few bird families more interesting than the unique, albeit species-poor, dippers (Cinclidae, the most aquatic of the passerines), the socially and vocally fascinating wrens (Troglodytidae), and the marvelous, mimicking Mimidae. A happier approach to this book, and this review, therefore, is that we're granted the bonus of three family accounts rolled into one book.

Originally published in Britain by Christopher Helm, the book covers 83 species of wrens, five dippers, and 36 mockingbirds and thrashers. Also included is the enigmatic "mockingthrush" *Donacobius*, historically viewed as a mimid or wren, but perhaps (according to unpublished dated cited here) closer to the Old World warblers and babblers. This is essentially a guide to New World birds, as only three of the species (a wren and two dippers) breed in the Old World.

An introductory text of 13 pages includes four pages explaining the species accounts, five on classification, relationships, and biogeography (with two full-page maps of species richness for wrens and mimids), a page and a half on conservation issues, and a standard page on bird topography. Some taxonomic treatments differ from those of the A.O.U.; the "Brown-throated Wren" (*Troglodytes brunneicollis*), for example, is split from House Wren (*T. aedon*) on the basis of an isozyme study by Brumfield and Capparella. Traditional generic relationships of wrens appear to require revision, according to unpublished work by F. K. Barker cited in the book.

The species accounts, introduced by brief but helpful accounts of generic characters, are generally fairly thorough, allowing that many species are poorly known. Text sections cover alternative names, identification, description, geographical variation, voice, habitat, habits, status and distribution, breeding, movements, measurements (from published sources or specimen measurements by the author), and references. Well-known or highly variable species (e.g., the Marsh and Winter Wrens) get two to four pages of text treatment, but some tropical or insular wrens get less than a page.

Identification information is sometimes sketchy. For Baja California's endemic Grey (in American English, Gray) Thrasher the identification section assures the reader that the only sympatric thrashers are Le Conte's and Sage, ignoring overlap with California Thrasher and vagrancy of the similar Bendire's Thrasher. Little useful information on separating Brown-throated and Northern House Wrens is provided, and readers are not warned of the considerable reported introgression that complicates field identification at the northern end of the former taxon's range. Behaviors useful in field identification are not always mentioned. For example, the highly distinctive bobbing behavior of the Rock and Canyon Wrens is omitted. Oddly, there is no mention of the wing-flashing display in the Northern Mockingbird account, yet this behavior is implied for the Northern in the accounts of some other species of *Mimus*.

All recognized subspecies are briefly described, along with range summaries; many are illustrated. Subspecies treatments are not always thorough or accurate. The California Thrasher's northern subspecies *sonomae* is described in the text and plate legend as differing from the nominate subspecies in having a "pale chest band," which is a feature not mentioned in Grinnell's original description or ever shown, to my

knowledge, by the birds themselves. There is no mention of the striking differences in call notes of Pacific and boreal/eastern Winter Wrens within North America.

The range maps are generally useful; the base maps show rivers and national boundaries, as well as state boundaries for Mexico and the USA. One can quibble about the accuracy of some maps. For example, desert and coastal Cactus Wren populations in California are far too separated, the Marsh Wren's breeding range in California is too restricted, and much of Great Basin range of Bewick's Wren is not mapped. Maps of band recoveries for a few migratory species, e.g., the "Eurasian" Dipper and Brown Thrasher, are informative. Distribution discussions generally gloss over or ignore vagrancy; there is no mention, for example, of the occurrence of the Brown Thrasher or Gray Catbird in California (both occur annually), yet California's record of the Blue Mockingbird (not accepted because of doubts about natural occurrence) is mentioned. The text seems to be well edited; one minor lapse I noted was the use of "Rufous" Thrasher for Brown Thrasher in the introduction to the genus *Toxostoma* on p. 229.

Since these "identification guides" are probably used more for easy access to information on distribution and biology (both comparative and for individual taxa) than for identification, it is perhaps not fair to dwell too much on the artwork. Yet such books are ultimately judged, in large measure, by the success of the illustrations. The plates in *Wrens, Dippers and Thrashers* have a number of weaknesses, from organization and figure selection to shapes, postures, and colors; many plates fall well short of the standards expected of the identification guide genre. For starters, a maddening lack of concordance between the position of the facing-page legends and the positions of the figures on the plates continues a problem that has plagued many of these family guides. There seems to be little logic to the plate layouts; positions and postures of individual birds are all different, hampering comparison. I can't help but wonder why the two Bahama Mockingbirds are depicted standing in water; if this is typical behavior, seemingly odd for a mimid, it is not explained in the text.

Similar sympatric species sometimes are not even on same plate; for example, the Sinaloa Wren is two plates removed from the Happy Wren, though the bizarre posture of the only figure of the former (with its head tucked in and bill hidden) makes its depiction close to useless anyway. Often, sex and age classes are mixed among subspecies, making it hard to distinguish subspecies characters from age/sex features. For example, in the Thrush-like Wren on plate 3, the unspotted figure of *unicolor* is of a female, whereas the spotted figures of the nominate bird and *hypostictus* are of males, falsely suggesting at first glance that the species is highly dimorphic sexually.

Many figures are anatomically challenged, especially the wings of certain thrashers (e.g., Cozumel Thrasher, plate 28), and the bill shape and bill/skull relationship in some thrashers and wrens (e.g., some species of *Campylorhynchus* on plate 4). In my copy some plates are far too gray, rendering the Curve-billed and Bendire's Thrashers on plate 29 virtually unrecognizable.

In summary, this "family guide" has a bit of an odd phylogenetic premise to go along with an erratic execution. Collectors of this sort of book will undoubtedly want to obtain it since the text brings together considerable published and some unpublished information; the plates, though somewhat flawed, provide a good overview of a fascinating collection of species. However, a more thorough and better illustrated monograph for each of these three families must still be awaited.

Kimball L. Garrett

Sibley's Birding Basics, by David Allen Sibley. 2002. Alfred A. Knopf, New York. 154 pp. Paperback. $15.95. ISBN 0-375-70966-5.

Every once in a while a book comes along and you think, "how is it that this wasn't done before?" *Sibley's Birding Basics* (hereafter *Basics*) is one such book. Its audience is really anyone who looks at birds in the field, beginner or expert—don't be fooled by the title. Beginners will find huge amounts of useful information to help them improve and refine their skills; experts will be reminded of their learning curves, have some things reinforced, and perhaps think, "wow, that's a really good way to think of such-and-such." Those of us who teach will be in a far better position to help others if we read this book—it cuts to the quick on a wide range of subjects in a clear, easy-going style. As well as good text, the book is liberally illustrated by thoughtful and well-executed sketches and paintings—each worth hundreds of words, if not a thousand each.

As the introduction to *Basics* states, this book is about interpreting what you see and hear in order to make better judgments—it is not a guide to the identification of any specific bird. Birdwatching can be practiced in many ways, from casual feeder watching to focused field ornithology. The common thread is an ability to see, to observe, and to interpret one's observations, whether it be to tell a male Northern Cardinal from a male Summer Tanager at the feeder or to distinguish the songs of Dusky and Hammond's flycatchers while recording data for a breeding-bird atlas. *Basics* comprises 16 short chapters that range from getting started watching birds to wing structure and molt. Chapters 1–5 cover introductory basics about being in the field and how to judge what one sees; chapters 6–15 cover important background topics, an understanding of which will strengthen any field observer's skills, and Chapter 16 is the obligatory note on ethics and conservation.

The first chapter emphasizes learning to see details, gaining experience, the importance of reading, and how to use your binoculars efficiently. One tip I might add to this last section is to learn roughly where the various focusing distances lie on the focus wheel and then to put the binoculars to your eyes *while you're looking at the bird*. That is, put the glass directly between you and the bird, then tweak the focus—don't take your eyes off the bird. Chapter 2 discusses field skills, including many things a lot of us take for granted, plus the importance of taking notes and sketching—things many of us don't do as much as we might. Chapter 3 runs through the challenges of bird identification, discussing sorting skills, the use of relative, proportional, and average differences among species, and how the mind can use (or misuse) partial clues. Chapter 4 covers misidentification: how and why it occurs, mainly because of misjudgment. Chapter 5 is a suitably brief discussion of identifying rare birds.

It is in chapters 6–15 that most readers of *Western Birds* may be most interested. Chapter 6 is a quick overview of taxonomy and emphasizes the importance of learning the genus of each bird—far more important for grouping similar species than trying to use common names. Chapter 7 points out the importance of behavioral clues in identification, and Chapter 8 is a very helpful overview of vocalizations, with tips on how to describe songs and calls in the field. Chapter 9, on understanding feathers, is the longest chapter and one that may take the greatest time for a beginner to assimilate. But the investment is well worth it, and anyone who absorbs most or all of this information will be far ahead of the pack when it comes to understanding what he or she sees in the field. Three sketches show passerine anatomy and eleven show nonpasserines ranging from the Great Blue Heron to the Rufous Hummingbird. As well as perusing these figures, remember to read the accompanying text. One point of potential disagreement in this chapter might be for tertials, which are treated as the three innermost secondaries, whose function is to cover and protect the other secondaries. Passerines generally do have three well-defined tertials, but how many tertials do gulls or some other nonpasserines have? Chapter 10 goes on to relate feather arrangements and color patterns, showing how the most complex patterns

usually have a simple foundation. Chapter 11 covers the structure and mechanics of tails and wings, again with numerous illustrations. A brief discussion of bare parts (or soft parts) is the subject of chapter 12, although, for no clear reason, legs and feet are not mentioned. Chapter 13 is a well-written overview of molt, including a clear comparison between the Humphrey–Parkes system and the traditional life-year system. Chapter 14 discusses feather wear and its consequences for the appearance of a bird, and chapter 15 covers age-related variation.

And that's it. A real gem in the world of bird books. One suggestion for readers of *Basics*: don't sit down and try to read it all at one sitting: it will overwhelm you, even though it's basic information. Read a chapter or two at a time, and read some chapters more than once. Dip into it from time to time to refresh your memory, and recommend it to any birder who wants to improve his or her skills.

Steve N. G. Howell

FEATURED PHOTO

A JANUARY SCARLET TANAGER SPECIMEN FROM NEW MEXICO

ROBERT W. DICKERMAN, Museum of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico 87131

PAGE DRAPER, 600 Lakeview Circle, Rio Rancho, New Mexico 87124

On 4 January 2002, a female-plumaged tanager (*Piranga* sp.) appeared in the yard of the Draper family in Rio Rancho, Sandoval Co., New Mexico. The bird was seen frequently in the Drapers' yard, which is heavily planted to be attractive for birds, for five days. It was observed feeding on the berries of *Photinia* cf. *fraseri*, and on a suet mixture containing mixed bird seed, peanut butter, and Crisco. It regularly used a bird bath and sunflower-seed feeder in a neighbor's yard. Draper tentatively identified it as a Scarlet Tanager (*Piranga olivacea*), but an experienced birdwatcher considered it to be a Summer Tanager (*P. rubra*). Photographs were taken and shown to an ornithologist who agreed that it was probably a Summer Tanager.

On 9 January the bird flew into a window at the Draper residence. It was immediately recovered and frozen. When it reached the Museum of Southwestern Biology, Dickerman immediately recognized it as a Scarlet Tanager. He prepared it as a study skin (MSB 32102), with one wing spread to show the white underwing coverts. It was a female with the ovary measuring 3 × 5 mm and the skull fully ossified. It weighed 27.1 grams, with heavy fat, and it was not in molt. The photos featured on this issue's back cover show the January specimen with two other Scarlet Tanagers in fresh fall plumage.

When compared with three other specimens in similar plumage, the Rio Rancho bird is distinctly paler above, the dorsum being near Grayish Olive (color 43) as opposed to Olive-Green (auxiliary) (color 48) of Smithe (1974, 1975, 1981). The bird is also paler ventrally, with the belly nearer Straw Yellow (color 56) than the Sulphur Yellow (color 55) of the other birds. In addition, it lacks the somewhat richer and deeper coloration of the breast. This generally paler coloration makes the specimen even more distinct from fall- and winter-plumaged female Summer Tanagers, especially from the eastern subspecies *P. r. rubra*, the only form yet collected during winter in New Mexico.

McNair and Escobar (1993) reviewed U. S. late fall and winter (22 November to 8 March) records of the Scarlet Tanager, finding 16 from seven states in the Southeast. Only two of these were reported with supporting evidence such as photographs. Those authors strongly suspected that some of the other records they listed represented misidentified female Summer Tanagers. Ironically, the Rio Rancho bird would have been misidentified as that species had it not flown into the window. This specimen is the fourth from New Mexico, where the Scarlet Tanager is otherwise known as a rare spring and fall migrant (Hubbard 1978). As far as we are aware, this is the first January specimen of the Scarlet Tanager from the U.S.

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Western Field Ornithologists and New Mexico Ornithological Society Joint Meeting

July 24–27, 2003

Western New Mexico University Silver City, New Mexico

CONFERENCE INFORMATION

The 28th annual meeting of the Western Field Ornithologists and the 41st annual meeting of the New Mexico Ornithological Society will be held jointly at the campus of Western New Mexico University in Silver City, New Mexico, July 24–27, 2003. The theme of the meeting will be the birds of the Mexican Borderlands, and it will promote exchange of biological information with professional and amateur ornithologists from both sides of the international border. Situated in the Madrean oak woodland habitats of the Southwestern Borderland region, Silver City, New Mexico, affords unique birding and orthithological research opportunities for the casual birder as well as the professional biologist. Late July is prime time for hummingbird viewing in this region, and up to 10+ species can be found within two hours' driving distance from the site of the meetings. Furthermore, this area affords great opportunities for viewing many southwestern specialty species such as the Common Black-Hawk, Zone-tailed Hawk, Montezuma Quail, Yellow-billed Cuckoo, Flammulated and Spotted Owls, Greater Pewee, Brown-crested Flycatcher, Mexican Jay, Juniper Titmouse, Crissal Thrasher, Olive and Red-faced Warblers, Painted Redstart, and Abert's Towhee.

Activities: Several organized half-day field trips are available, including a representative sampling of birds and habitats of southwestern New Mexico and northwestern Chihuahua. Participants can explore the region's diverse habitats on their own as well, using the just published third edition of the *New Mexico Bird Finding Guide* (available for $20, postage included, from New Mexico Ornithological Society, P. O. Box 3068, Albuquerque, NM 87190-3068). A field trip to the Sierra Madre Occidental in Chihuahua, Mexico, follows the meeting. As at previous WFO meetings, afternoon professional paper sessions and identification slide panels are planned. Social activities include a welcoming reception, a Friday evening social event, and the concluding banquet and evening program on Saturday. For those diverse individuals who are slightly less interested in the birding opportunities, there are also many other cultural and historical sites to visit in the immediate vicinity, such as Gila Cliff Dwelling National Monument.

Speakers: The featured speaker after the Saturday evening banquet is Dr. Noel Snyder from Portal, Arizona. Dr. Snyder is the co-author of *The California Condor: A Saga of Natural History and Conservation* and *Birds of Prey: Natural History and Conservation of North American Raptors*. His presentation is entitled "Conservation and Reintroduction of Thick-billed Parrots: Future Prospects."

On Friday night 25 July Dr. Dale Zimmerman from Silver City, New Mexico, will be making a presentation on the birds of the borderlands region. Dr. Zimmerman is a long-time resident of Silver City and a pioneer in many ornithological investigations within this bird-rich region.

Lodging: A block of 30 rooms has been reserved at the Silver City Holiday Inn Express (505-538-2525) for this meeting. Prices are set at $60/night and are reserved under "WFO Meetings" with a confirmation number 68518772. These rooms are available on a first-come first-served basis until 15 June 2003. A wide variety of hotels, bed-and-breakfasts, and guest inns is also available in the greater Silver City area. This is a popular destination for summer visitors, so make reservations early. Please visit www.silvercity.org on the World Wide Web to view alternate accommodations, prices, and telephone numbers, as well as recreational activities for the area.

For additional information contact dave_krueper@fws.gov and watch WFO's website, www.wfo-cbrc.org, for updates.

WESTERN BIRDS

World Wide Web site: www.wfo-cbrc.org

Quarterly Journal of Western Field Ornithologists

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The California Bird Records Committee of Western Field Ornithologists revised its 10-column Field List of California Birds in February 2002. The last list covered 613 accepted species; the new list covers 619 species. Please send orders to WFO, c/o Robbie Fischer, Treasurer, 1359 Solano Drive, Pacifica, CA 94044. California addresses please add 8.25% sales tax.

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Published June 15, 2003 ISSN 0045-3897

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WESTERN BIRDS

Vol. 34, No. 2, 2003

Western Specialty:
Lazuli Bunting

Photo by Peter LaTourrette of Los Altos, California: Lazuli Bunting (*Passerina amoena*), San Benito County, California, 2 May 2001.

Volume 34, Number 2, 2003

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Featured Photo: A Leucistic Willet in California *Charles T. Collins* 118

Front cover photo by © W. Edward Harper of Sacramento, California: Golden-winged Warbler (*Vermivora chrysoptera*), Point Reyes National Seashore, Marin County, California, 27 September 2002.

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WESTERN BIRDS

Volume 34, Number 2, 2003

THE OCCURRENCE AND SEASONAL DISTRIBUTION OF MIGRATORY BIRDS ON SOUTHEAST FARALLON ISLAND, 1968–1999

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ABSTRACT: Daily monitoring of migrating birds at Southeast Farallon Island, initiated in 1968, has continued uninterrupted. The number of species recorded on this 44-hectare island reached 403 in 2002. Ten species of waterbird, in descending order of abundance, the Sooty Shearwater, Brown Pelican, Red and Red-necked Phalaropes, Pacific Loon, Buller's Shearwater, Bonaparte's Gull, Black-legged Kittiwake, and Heerman's and Glaucous-winged Gulls, averaged over 500 individuals recorded annually. Nine species of landbird, in descending order of abundance, the European Starling, White-crowned and Golden-crowned Sparrows, Yellow-rumped Warbler, Savannah Sparrow, Dark-eyed Junco, Ruby-crowned Kinglet, Wilson's Warbler, and American Pipit, averaged over 125 individuals annually. Since migrants on the island were last summarized through 1989, one notable change has been an increase in skuas, jaegers, Arctic and Elegant Terns, and Sabine's Gulls, perhaps reflecting an increase in Pacific Sardines in surrounding waters. Increases in the Brown Booby and Black-vented Shearwater may also be evidence of warmer late summer and fall water temperatures in the past 10 years. On the other hand, the occurrence of most species of ducks decreased dramatically during the 1990s, perhaps reflecting decreased population sizes and/or an increased wintering population of Peregrine Falcons at the Farallones. Preliminary analyses suggest that, over the 32-year monitoring period, mean spring arrival dates for many species of landbirds have become earlier and mean fall arrival dates have become later. Of species averaging at least 10 records per season, 10 of 11 species in spring and 28 of 38 species in fall showed this pattern when data from 1968–1989 are compared with those from 1968–1999.

The Point Reyes Bird Observatory (PRBO) has conducted standardized, daily censuses of all migrant bird species on Southeast Farallon Island, California, since 3 April 1968. Prior to this, back to the mid 19th century, ornithologists visited the island irregularly. DeSante and Ainley (1980) summarized the occurrence patterns of 331 species recorded on the island from 1854 to 2 April 1976. Pyle and Henderson (1991) noted 375 species

recorded on the island through 31 December 1989 and summarized the occurrence patterns of 359 species, 20 intraspecific forms, and four interspecific hybrids recorded from 3 April 1968 through 31 December 1989. Here we update Pyle and Henderson's work, noting 400 species recorded on Southeast Farallon Island through 31 December 1999, as well as an additional three species recorded from 2000 through 2002, bringing the total number of species recorded on the island to 403. We have summarized the occurrence patterns of 385 migratory species, 13 intraspecific forms, 7 interspecific hybrids, 5 species pairs (e.g., Lesser Golden-Plover, *Pluvialis dominica/fulva*), and one species triplet (Solitary Vireo, *Vireo solitarius/cassinii/plumbeus*) recorded from 3 April 1968 through 31 December 1999. For each migratory species we provide seasonal arrival data for both spring and fall. We also summarize totals of winter arrivals and overwinter residents.

STUDY AREA AND CENSUSING METHODS

The bird-monitoring program on Southeast Farallon Island (Figure 1) has been described by DeSante and Ainley (1980), DeSante (1983), and Pyle and Henderson (1991). Each day PRBO personnel census all migrants. Most landbirds congregate at four or five vegetated or prominent areas on the island, facilitating their detection, and we estimate a detection rate of over 95% for birds present on a given day. The environmental conditions and censusing procedures varied little over the 32-year period of data collection. The three Monterey Cypress (*Cupressus macrocarpa*) saplings planted in 1982 (see Pyle and Henderson 1991) have grown in height since 1991, but we assume that this growth has little or no effect on landbird

Figure 1. Southeast Farallon Island as viewed from the south. The Point Reyes Peninsula is visible in the background, 29 km to the north.

Photo by Pete Warzybok/PRBO

arrival. Personnel attempted to band as many individuals as possible, alternating the location of bands (right leg versus left leg) daily. This banding, in combination with efforts to determine the age, sex, and in many cases, individual identity, of all landbirds in the field, aided the determination of turnover rates. Personnel censused shorebird roosts and freshwater seepages daily at high tide in all months except April through July, when coastal access was restricted to prevent disturbance to breeding seabirds. Conditions permitting, 5-minute counts of seabird passage were conducted each morning, which we used to calculated daily arrivals of migratory species. Also, if weather and visibility permitted, roosting Brown Pelicans (*Pelecanus occidentalis*) were counted each morning.

TERMINOLOGY AND METHODS OF ANALYSIS

We summarize data for 385 migratory species recorded from 3 April 1968 to 31 December 1999 (Table 1) and append notes of interest following Pyle and Henderson (1991). We categorized the data (Table 1) in the manner of Pyle and Henderson (1991). Briefly, we list all migratory species identified with confidence on, from, or within 2 km of the island during the 32-year census period. Also included in Table 1 are additional subentries for 13 subspecific taxa, two subspecific intergrades, seven interspecific hybrids, five species pairs, and one species triplet for which a substantial portion of the individuals were identified to the pair or triplet but not to the species. Subentries for subspecific taxa are included only where subspecies have been identified throughout the full (1968–1999) period.

We did not include in the totals birds not confidently identified to species or species pair, rare species, or unseasonal records of birds that were not adequately described by the observer. For rare and vagrant species we follow the evaluations of the California Bird Records Committee (CBRC), whose reports are published annually in *Western Birds* (e.g., McKee and Erickson 2002). With the exception of a few individuals, listed in the notes, or records not reviewed by the CBRC since 1980, records not accepted by the CBRC are considered hypothetical by us and are not included in the table. Following the table, we list separately four hypothetical species and five escaped non-native species recorded during the 32-year period. Hypothetical species include those not endorsed by the CBRC but we believe very likely correctly identified. We have omitted two other species considered hypothetical by Pyle and Henderson (1991), the Red-necked Stint (*Calidris ruficollis*) and Thick-billed Kingbird (*Tyrannus crassirostris*), because we are now using a more conservative definition of "hypothetical." Other species in this category, for which records have been rejected by the CBRC, are the Common Ringed Plover (*Charadrius hiaticula*), Gray-tailed Tattler (*Heteroscelus brevipes*), Olive Warbler (*Peucedramus taeniatus*), and Eastern Meadowlark (*Sturnella magna*). See Patten et al. (in press) for more information on these records.

Fifteen of the 400 species recorded on the island through 1999 are not included in the table. Twelve are breeding seabirds, which are not censused daily (see Pyle and Henderson 1991 for a list of these). The remaining three species, the Short-tailed Albatross (*Phoebastria albatrus*), Black Rail

(*Laterallus jamaicensis*), and Clapper Rail (*Rallus longirostris*), were recorded on the island before 1968, but not during the period for which we report. DeSante and Ainley (1980) provided details on these species and others reported from the island prior to 1968. Two new species were recorded in 2000 (Great-tailed Grackle, *Quiscalus mexicanus*, on 6 May, and Common Grackle, *Q. quiscula*, present from 19 November to 8 December), and one new species was recorded in 2002 (Little Bunting, *Emberiza pusilla*, 27–28 September). These additional species bring the total number of species recorded through January 2003 to 403.

Seasonal definitions follow DeSante and Ainley (1980) and Pyle and Henderson (1991): for most species, spring is 1 March–14 July, fall is 15 July–19 December, and winter is 20 December–28 (or 29) February. For shorebirds (suborder Charadrii), spring is 1 March–20 June and fall is 21 June–19 December. The data presented in Table 1 follow these seasonal definitions, with the exception of 47 records of 17 species that we reclassified after a careful examination of occurrence patterns (see DeSante and Ainley 1980:6, Pyle and Henderson 1991). The mean dates of arrival and the standard deviations (in days) around the means are presented for both spring and fall. We follow DeSante and Ainley (1980) and Pyle and Henderson (1991) in defining winter residents as individuals that remained on the island for >20 days, of which at least five days fell within the winter season.

DeSante and Ainley (1980), Desante (1983), Pyle et al. (1994), and Pyle and DeSante (1994) analyzed trends and arrival patterns of migrant waterbirds, raptors, and nocturnal migrants at Southeast Farallon Island, and Pyle et al. (1993) examined the effects of weather and lunar cycle on nocturnal migrants. Updates to some of these analyses are planned for the future.

NOTES

Red-necked Grebe—The arrival pattern of this species is perhaps more accurately represented by a single over-winter peak (mean arrival 5 January ± 54 days).

Eared Grebe—The mean winter date of all records is 13 January ± 53 days.

Black-footed Albatross—This species' abundance peaking in the summer is best defined by the arrival of 259 individuals from 28 February through 30 August (mean arrival 25 April ± 42 days). The remaining 34 records are scattered widely between 3 September and 31 January.

Northern Fulmar—The arrival pattern of this species is best represented by a single over-winter peak (mean arrival 5 January ± 46 days).

Sooty Shearwater—The arrival pattern of this species is perhaps more accurately represented by a single over-summer peak (mean arrival 24 July ± 52 days).

Manx Shearwater—The table includes a record for 9 October 1997 not accepted by the CBRC.

Brown Booby—The table includes an individual present 3–7 October 1997, a record not reviewed by the CBRC. Note that our arrival calculations consider individuals returning in subsequent years to be new arrivals. Thus, the arrival on 16 August 1993 of a Brown Booby that first arrived in 1992 is counted twice in the totals.

Table 1 Occurrence and Seasonal Distribution of Birds on Southeast Farallon Island

Species	Spring					Fall				Winter	
	Total	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Total	Residents
Red-throated Loon	115	32	7 Mar–11 Jul	21 Apr ±36	4 30 Mar 69	72	1 Aug–19 Dec	2 Nov ±27	6 1 Nov 75	11	0
Gavia stellata											
Pacific Loon	53,790	8850	1 Mar–14 Jul	23 Apr ±17	1853 24 Apr 81	39,022	17 Jul–19 Dec	11 Nov ±11	4000 15 Nov 83	5918	59
G. pacifica											
Common Loon	2049	238	2 Mar–13 Jul	10 May ±19	100 8 May 84	1426	18 Jul–19 Dec	3 Nov ±16	200 5 Nov 83	385	2
G. immer											
Yellow-billed Loon[a]	1	0	—	—	0	1	16 Dec	16 Dec —	1 17 Dec 97[b]	0	0
G. adamsii											
Pied-billed Grebe	13	1	14 Jul	14 Jul —	1 14 Jul 86	12	26 Aug–28 Oct	27 Sep ±21	2 29 Aug 89[b]	0	0
Podilymbus podiceps											
Horned Grebe	92	12	1 Mar–24 Mar	17 Mar ±15	4 5 Mar 77[b]	58	16 Sep–16 Dec	26 Oct ±22	6 2 Oct 96	22	7
Podiceps auritus											
Red-necked Grebe	154	30[c]	1 Mar–29 May	27 Mar ±24	3 10 Mar 85[b]	71[c]	12 Sep–19 Dec	19 Nov ±25	6 19 Dec 87	53[c]	12
P. grisegena											
Eared Grebe	14,367	3213[c]	1 Mar–23 Jun	27 Mar ±17	1100 10 Apr 77	5559[c]	17 Jul–19 Dec	20 Nov ±23	350 19 Dec 76	5595[c]	7578
P. nigricollis											
Western Grebe	418	12	7 Mar–7 Jul	3 May ±40	2 1 Jul 95[b]	388	17 Jul–12 Dec	22 Oct ±21	73 27 Oct 88	18	21
Aechmophorus occidentalis											
Clark's Grebe	47	11	19 Mar–27 Jun	28 May ±34	3 15 Jul 77	35	23 Jul–29 Nov	18 Oct ±33	4 24 Nov 99	1	0
A. clarkii											
Total W./Clark's Grebe	1039	124	1 Mar–10 Jul	7 May ±33	8 24 Mar 74	864	17 Jul–19 Dec	22 Oct ±23	74 27 Oct 88	51	32
A. occidentalis/clarkii											
Laysan Albatross	5	2	21 Mar–22 Mar	22 Mar ±1	1 22 Mar 95[b]	2	7 Dec	7 Dec —	1 7 Dec 83	1	0
Phoebastria immutabilis											
Black-footed Albatross	294	243[c]	1 Mar–5 Jul	19 Apr ±34	32 22 Mar 95	43[c]	19 Jul–18 Dec	24 Sep ±50	5 9 Sep 99	8[c]	0
P. nigripes											
Northern Fulmar	9536	1535[c]	1 Mar–28 Jun	18 Mar ±17	200 19 Apr 90	4254[c]	28 Jul–19 Dec	23 Nov ±20	990 2 Dec 90	3747[c]	0
Fulmarus glacialis											

Murphy's Petrel *Pterodroma ultima*	1	0	—	—	0	1	27 Aug	27 Aug —	1 27 Aug 90	0	0
Pink-footed Shearwater *Puffinus creatopus*	18,895	1184	27 Feb– 14 Jul	23 May ±28	50 31 May 90	17,711	19 Jul– 18 Dec	30 Sep ±27	1093 7 Nov 97	0	0
Flesh-footed Shearwater *P. carneipes*	25	0	—	—	0	25	15 Sep– 7 Nov	14 Oct ±18	3 30 Oct 98	0	0
Buller's Shearwater *P. bulleri*	40,243	0	—	—	0	40,243	3 Aug– 1 Dec	6 Oct ±16	1570 3 Oct 86	0	0
Sooty Shearwater *P. griseus*	5,283,793	2,259,105[c]	1 Mar– 14 Jul	29 May ±22	400,000 18 Jun 74	3,024,309[c]	15 Jul– 19 Dec	3 Sep ±19	220,125 28 Aug 84	379[c]	0
Short-tailed Shearwater *P. tenuirostris*	477	7	1 Mar– 6 Mar	3 Mar ±2	2 4 Mar 91[b]	464	23 Aug– 12 Dec	12 Nov ±21	80 25 Nov 98	6	0
Manx Shearwater[a] *P. puffinus*	7	1	22 Mar	22 Mar —	1 21 Mar 95	6	31 Aug– 15 Oct	24 Sep ±16	1 3 Oct 98[b]	0	0
Black-vented Shearwater *P.opisthomelas*	15,607	13	1 Mar– 2 Jun	14 Apr ±40	4 2 Jun 92	15,593	19 Jul– 12 Dec	8 Nov ±13	6924 7 Nov 97	1	0
Fork-tailed Storm-Petrel *Oceanodroma furcata*	1119	1065	13 Mar– 23 Jun	21 Mar ±12	1000 18 Mar 77	13	27 Jul– 4 Nov	25 Sep ±29	3 14 Oct 97	41	0
Black Storm-Petrel *O. melania*	45	0	—	—	0	45	22 Aug– 28 Oct	27 Aug ±12	27 24 Aug 83	0	0
Red-tailed Tropicbird[a] *Phaethon rubricauda*	2	1	3 Jul	3 Jul —	1 3 Jul 79	1	11 Sep	11 Sep —	1 11 Sep 96	0	0
Masked Booby[a] *Sula dactylatra*	1	0	—	—	0	1	9 Aug	9 Aug —	1 9 Aug 94	0	0
Brown Booby[a] *S. leucogaster*	11	2	25 May– 1 Jul	13 Jun ±26	1 13 Jul 92[b]	9	9 Aug– 1 Nov	25 Sep ±27	1 7 Nov 99[b]	0	0
Red-footed Booby[a] *S. sula*	2	0	—	—	0	2	26 Aug– 12 Oct	19 Sep ±33	1 12 Oct 75[b]	0	0
Brown Pelican *Pelecanus occidentalis*	268,004	20,542[c]	2 Mar– 14 Jul	11 Jun ±28	2454 8 Jun 88	233,849[c]	15 Jul– 19 Dec	29 Sep ±33	5670 9 Sep 84	13,613[c]	0
Magnificent Frigatebird[d] *Fregata magnificens*	6	3	20 May– 2 Jul	13 Jun ±22	1 17 Jun 93[b]	3	16 Jul– 16 Dec	6 Sep ±87	1 16 Dec 88[b]	0	0
Great Frigatebird[a, d] *Fregata minor*	1	1	14 Mar	14 Mar —	1 14 Mar 92	0	—	—	0	0	0

(continued)

Table 1 *(Continued)*

Species	Spring					Fall				Winter	
	Total	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Total	Residents
American Bittern	5	0	—	—	0	5	16 Sep–26 Oct	10 Oct ±16	1 16 Sep 91[b]	0	0
Botaurus lentiginosus											
Great Blue Heron	212	12[c]	3 Mar–14 Jul	11 Jun ±44	2 6 Jul 88[b]	198[c]	16 Jul–6 Dec	9 Sep ±24	6 18 Sep 92	2[c]	3
Ardea herodias											
Great Egret	58	2	13 Jun–14 Jun	14 Jun ±1	1 13 Jun 75[b]	55	24 Jul–19 Nov	24 Sep ±31	4 14 Sep 93	1	0
A. alba											
Snowy Egret	45	7	27 Apr–13 Jul	16 Jun ±31	1 11 May 89[b]	38	18 Jul–19 Dec	20 Sep ±40	7 8 Oct 88	0	1
Egretta thula											
Cattle Egret	104	1	18 May	18 May —	1 18 May 94	95	16 Sep–19 Dec	22 Nov ±17	21 23 Nov 84	8	6
Bubulcus ibis											
Green Heron	25	5	29 Apr–13 Jul	16 Jun ±30	1 14 Jun 87[b]	20	1 Aug–14 Oct	17 Sep ±17	1 22 Sep 98[b]	0	0
Butorides virescens											
Black-crowned Night-Heron	12	1	18 Mar	18 Mar —	1 18 Mar 95	10	18 Aug–12 Nov	24 Sep ±30	2 21 Oct 97[b]	1	0
Nycticorax nycticorax											
White-faced Ibis	1	0	—	—	0	1	17 Sep	17 Sep —	1 18 Sep 99[b]	0	0
Plegadis chihi											
Turkey Vulture	2	2	22 May	22 May ±0	2 22 May 79	0	—	—	0	0	0
Cathartes aura											
Greater White-fronted Goose	306	3	10 Mar–6 Jul	28 Mar ±31	2 10 Mar 80	380	20 Sep–6 Nov	10 Oct ±13	97 2 Oct 99	1	0
Anser albifrons											
Emperor Goose[d]	2	0	—	—	0	0	—	—	0	2	1
Chen canagica											
Snow Goose	146	0	—	—	0	146	15 Oct–1 Dec	5 Nov ±3	128 6 Nov 90	0	1
C. caerulescens											
Ross' Goose	14	0	—	—	0	14	6 Nov–11 Dec	9 Nov ±9	13 6 Nov 90	0	0
C. rossii											
Canada Goose	915	2	15 Mar–30 Apr	7 Apr ±33	1 30 Apr 80[b]	889	19 Sep–18 Dec	8 Nov ±11	401 4 Nov 78	24	10
Branta canadensis											
Brant	16,413	1451	18 Mar–22 May	11 Apr ±22	440 22 Mar 79	14,960	2 Oct–18 Dec	7 Nov ±6	7200 4 Nov 83	2	1
B. bernicla											

Tundra Swan *Cygnus columbianus*	11	0	—	—	0	11	11 Nov– 18 Dec	14 Nov ±11	10 11 Nov 78	0	0
Wood Duck *Aix sponsa*	2	0	—	—	0	2	21 Sep– 31 Oct	11 Oct ±20	1 31 Oct 95[b]	0	0
Gadwall *Anas strepera*	8	0	—	—	0	8	14 Aug– 19 Dec	10 Oct ±45	3 30 Oct 96	0	0
Eurasian Wigeon *A. penelope*	1	0	—	—	0	1	1 Oct	1 Oct —	1 1 Oct 98	0	0
American Wigeon *A. americana*	98	0	—	—	0	98	11 Sep– 24 Nov	15 Oct ±15	20 18 Oct 99	0	0
Mallard *A. platyrhynchos*	101	7	31 Mar– 30 Apr	13 Apr ±12	2 10 Apr 88[b]	94	13 Aug– 8 Dec	24 Oct ±25	13 16 Oct 99	0	0
Blue-winged Teal *A. discors*	7	0	—	—	0	7	22 Sep– 13 Oct	2 Oct ±8	2 5 Oct 90[b]	0	0
Cinnamon Teal *A. cyanoptera*	115	10[c]	1 Mar– 2 Mar	2 Mar ±0	7 2 Mar 79	88	5 Sep– 10 Nov	24 Sep ±12	17 20 Sep 91	17[c]	0
Northern Shoveler *A. clypeata*	56	1	27 Jun	27 Jun —	1 27 Jun 89	55	14 Aug– 14 Nov	5 Oct ±20	12 1 Oct 98	0	0
Northern Pintail *A. acuta*	3554	5	12 Mar– 20 Mar	15 Mar ±3	3 15 Mar 77	3546	27 Jul– 8 Dec	22 Sep ±25	175 19 Oct 78	3	0
Green-winged Teal *A. crecca*	381	0	—	—	0	380	14 Aug– 17 Dec	13 Oct ±25	39 13 Oct 87	1	0
Canvasback *Aythya valisineria*	2	0	—	—	0	2	24 Oct– 28 Nov	11 Nov ±25	1 24 Oct 88[b]	0	0
Ring-necked Duck *A. collaris*	1	0	—	—	0	1	7 Oct	7 Oct —	1 8 Oct 87[b]	0	0
Greater Scaup *A. marila*	128	1	24 Apr	24 Apr —	1 24 Apr 93	125	19 Sep– 11 Dec	22 Oct ±14	18 27 Oct 88	2	0
Lesser Scaup *A. affinis*	13	0	—	—	0	13	29 Sep– 8 Nov	25 Oct ±14	6 30 Oct 89	0	0
Harlequin Duck *Histrionicus histrionicus*	23	3	25 Mar– 20 May	22 Apr ±28	2 24 Apr 81[b]	11	23 Jul– 19 Dec	6 Oct ±52	2 2 Dec 78	9	5
Surf Scoter *Melanitta perspicillata*	5405	2245	2 Mar– 5 Jul	4 Apr ±21	200 21 Apr 82[b]	2406[c]	16 Jul– 19 Dec	12 Nov ±20	233 13 Nov 89	754	474

(continued)

Table 1 *(Continued)*

Species	Spring					Fall				Winter	
	Total	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Total	Residents
White-winged Scoter *M. fusca*	469	188	1 Mar–6 Jul	5 Apr ±20	33 9 Apr 85	197	14 Sep–19 Dec	7 Nov ±19	35 30 Oct 71	84	28
Black Scoter *M. nigra*	25	2	7 Mar–23 Mar	15 Mar ±11	1 23 Mar 95[b]	13	9 Oct–9 Dec	5 Nov ±27	5 9 Oct 85	10	0
Long-tailed Duck *Clangula hyemalis*	31	5[c]	2 Mar–10 Mar	8 Mar ±3	2 10 Mar 81[b]	14[c]	16 Oct–11 Dec	16 Nov ±24	3 20 Nov 80[b]	12[c]	0
Bufflehead *Bucephala albeola*	8	6	2 Apr–7 Apr	6 Apr ±2	5 7 Apr 82	2	13 Nov–17 Dec	30 Nov ±24	1 13 Nov 89[b]	0	0
Common Goldeneye[d] *B. clangula*	19	5	12 Apr–6 Jun	7 May ±22	2 15 May 70	2	7 Dec–17 Dec	12 Dec ±7	2 17 Dec 78	12	2
Barrow's Goldeneye[d] *B. islandica*	1	0	—	—	0	0	—	—	0	1	0
Red-breasted Merganser *Mergus serrator*	388	53[c]	4 Mar–17 May	28 Mar ±19	6 18 Mar 86[b]	193[c]	16 Oct–19 Dec	24 Nov ±14	10 23 Nov 73	142[c]	112
Ruddy Duck *Oxyura jamaicensis*	29	1	11 Apr	11 Apr —	1 11 Apr 97	26	27 Sep–7 Dec	25 Oct ±18	15 25 Oct 70	2	0
Osprey *Pandion haliaetus*	51	7	29 Mar–31 May	6 May ±23	1 27 Apr 92[b]	44	23 Jul–20 Nov	19 Sep ±22	2 24 Sep 89	0	0
White-tailed Kite *Elanus leucurus*	23	0	—	—	0	23	11 Sep–8 Dec	12 Oct ±20	2 19 Sep 99[b]	0	0
Bald Eagle *Haliaeetus leucocephalus*	7	0	—	—	0	5	1 Oct–22 Nov	30 Oct ±24	1 10 Oct 98[b]	2	0
Northern Harrier *Circus cyaneus*	237	1	6 Apr	6 Apr —	1 6 Apr 82	236	27 Jul–13 Dec	20 Oct ±25	6 6 Oct 94[b]	0	0
Sharp-shinned Hawk *Accipiter striatus*	333	0	—	—	0	331	11 Sep–29 Nov	8 Oct ±19	13 18 Sep 88	2	0
Cooper's Hawk *A. cooperii*	28	0	—	—	0	28	12 Sep–22 Oct	1 Oct ±8	3 29 Sep 74	0	0
Red-tailed Hawk *Buteo jamaicensis*	16	4	6 Apr–22 May	21 Apr ±21	1 14 Apr 99[b]	10	24 Sep–12 Dec	2 Nov ±21	1 7 Nov 97[b]	2	3

Rough-legged Hawk *B. lagopus*	49	0	—	—	0	47	28 Sep– 11 Dec	9 Nov ±17	12 27 Oct 73	2	4
Golden Eagle *Aquila chrysaetos*	1	0	—	—	0	1	28 Oct	28 Oct —	1 28 Oct 71	0	0
American Kestrel[d] *Falco sparverius*	475	4	8 Mar– 26 Jun	25 May ±52	2 14 Mar 89[b]	460	24 Jul– 15 Dec	8 Oct ±26	5 1 Oct 98[b]	11	32
Merlin *F. columbarius*	246	0	—	—	0	246	7 Sep– 24 Nov	10 Oct ±18	5 30 Sep 98	0	0
Peregrine Falcon[d] *F. peregrinus*	531	75	1 Mar– 29 Jun	20 Apr ±28	4 29 Mar 95[b]	428	22 Jul– 18 Dec	14 Oct ±26	6 7 Oct 97[b]	28	103
Prairie Falcon *F. mexicanus*	1	0	—	—	0	1	23 Sep	23 Sep —	1 23 Sep 80	0	0
Virginia Rail *Rallus limicola*	8	0	—	—	0	8	11 Aug– 21 Sep	30 Aug ±12	2 26 Aug 87	0	0
Sora *Poranza carolina*	24	3	28 Mar– 30 Jun	18 May ±48	1 28 Mar 90[b]	21	21 Jul– 15 Oct	11 Sep ±21	2 15 Oct 82	0	0
Common Moorhen *Gallinula chloropus*	3	2	13 May– 6 Jun	25 May ±17	1 22 May 89[b]	1	—	—	0	0	0
American Coot *Fulica americana*	18	2	11 May– 12 May	12 May ±1	1 12 May 81[b]	16	11 Aug– 27 Oct	30 Sep ±17	2 29 Sep 96[b]	0	0
Black-bellied Plover *Pluvialis squatarola*	1156	62	1 Mar– 11 May	30 Mar ±16	11 14 Mar 80[b]	1068	17 Jul– 15 Dec	25 Sep ±35	42 26 Oct 81	26	365
American Golden-Plover[e] *P. dominica*	5	0	—	—	0	5	5 Sep– 17 Sep	13 Sep ±5	2 17 Sep 91[b]	0	0
Pacific Golden-Plover[e] *P. fulva*	32	0	—	—	0	32	17 Sep– 2 Dec	11 Oct ±18	8 5 Oct 91	0	1
Total Lesser Golden-Plover[e] *P. dominica/fulva*	161	3	28 Apr– 28 May	8 May ±17	1 28 May 80[b]	157	8 Aug– 9 Dec	7 Oct ±23	14 17 Oct 89	1	1
Snowy Plover *Charadrius alexandrinus*	4	0	—	—	0	4	27 Aug– 5 Oct	17 Sep ±16	1 22 Sep 91[b]	0	0
Semipalmated Plover *C. semipalmatus*	300	0	—	—	0	300	21 Jul– 28 Oct	31 Aug ±14	30 26 Aug 75	0	0
Killdeer[d] *C. vociferus*	578	18	16 Mar– 16 Jun	14 May ±26	2 4 May 80[b]	488	12 Jul– 19 Dec	19 Oct ±30	27 26 Oct 88	72	23

(continued)

Table 1 *(Continued)*

Species	Spring					Fall				Winter	
	Total	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Total	Residents
Eurasian Dotterel[a] *C. morinellus*	2	0	—	—	0	2	12 Sep–15 Sep	14 Sep ±2	1 15 Sep 89[b]	0	0
Black-necked Stilt *Himantopus mexicanus*	4	0	—	—	0	2	23 Jun	23 Jun ±0	2 23 Jun 99	2	0
American Avocet *Recurvirostra americana*	6	0	—	—	0	5	28 Jul–29 Nov	19 Aug ±73	2 29 Nov 95	1	0
Greater Yellowlegs *Tringa melanoleuca*	87	1	29 Apr	29 Apr —	1 29 Apr 68	86	5 Jul–2 Dec	22 Sep ±25	5 20 Sep 91	0	0
Lesser Yellowlegs *T. flavipes*	63	1	3 May	3 May —	1 3 May 71	62	27 Sep	10 July–21 Aug ±19	6 16 Aug 87	0	0
Solitary Sandpiper *T. solitaria*	1	0	—	—	0	1	7 Sep	7 Sep —	1 7 Sep 89	0	0
Willet *Catoptrophorus semipalmatus*	934	31	22 Mar–20 Jun	9 May ±25	23 6 Mar 83	896	15 Dec	21 Jun–2 Sep ±37	27 20 Oct 77	7	528
Wandering Tattler *Heteroscelus incanus*	1744	336	2 Mar–16 Jun	1 May ±20	21 19 May 76[b]	1393	23 Jun–10 Dec	1 Sep ±33	56 17 Aug 89	15	375
Spotted Sandpiper *Actitis macularia*	158	12	20 Apr–14 Jun	14 May ±14	1 25 Mar 94[b]	146	23 Jul–15 Nov	6 Sep ±20	4 4 Sep 89[b]	0	2
Upland Sandpiper[a] *Bartramia longicauda*	2	0	—	—	0	2	22 Aug–27 Aug	25 Aug ±4	1 27 Aug 89[b]	0	0
Whimbrel *Numenius phaeopus*	1437	276	7 Mar–19 Jun	13 May ±16	90 19 May 91	1153	24 Jun–13 Dec	29 Aug ±29	131 27 Aug 83	8	345
Long-billed Curlew *N. americanus*	7	0	—	—	0	7	28 Jun–23 Nov	20 Aug ±52	1 30 Sep 96[b]	0	0
Bar-tailed Godwit[a] *Limosa lapponica*	1	0	—	—	0	1	11 Sep	11 Sep —	1 11 Sep 99	0	0
Marbled Godwit *Limosa fedoa*	560	9	16 Mar–1 Jun	3 May ±28	2 1 Jun 92[b]	551	28 Jun–27 Nov	4 Sep ±22	27 14 Aug 75	0	0
Ruddy Turnstone *Arenaria interpres*	438	49	13 Mar–5 Jun	2 May ±21	12 6 Mar 87	373	2 Jul–19 Dec	13 Sep ±35	25 16 Dec 87	16	90

Black Turnstone	3851	139	1 Mar–	18 Apr	71	3459	21 Jun–	17 Sep	106	253	1824
A. melanocephala			10 Jun	±29	5 Mar 85		15 Dec	±35	25 Sep 75		
Surfbird	261	21	21 Mar–	20 Apr	5	226	17 Jul–	2 Sep	19	14	19
Aphriza virgata			2 May	±9	21 Apr 90[b]		19 Dec	±30	8 Aug 68		
Red Knot	6	0	—	—	0	6	7 Sep–	17 Sep	1	0	0
Calidris canutus							3 Oct	±10	15 Sep 91[b]		
Sanderling	195	3	23 Mar–	25 Mar	2	189	6 Jul–	12 Sep	14	3	0
C. alba			29 Mar	±3	23 Mar 90		14 Dec	±31	17 Sep 75		
Semipalmated Sandpiper[e]	12	0	—	—	0	12	3 Aug–	18 Aug	2	0	0
C. pusilla							16 Sep	±10	20 Aug 77		
Western Sandpiper	976	0	—	—	0	970	5 Jul–	31 Aug	96	6	0
C. mauri							14 Dec	±18	17 Aug 89		
Least Sandpiper	508	9	6 Mar–	31 Mar	6	496	10 Jul–	2 Sep	24	3	0
C. minutilla			10 May	±18	31 Mar 90		15 Dec	±21	16 Aug 97		
Baird's Sandpiper	286	1	11 May	11 May	1	285	10 Jul–	26 Aug	16	0	0
C. bairdii				—	11 May 69		11 Oct	±14	16 Aug 87		
Pectoral Sandpiper	362	1	4 May	4 May	1	361	27 Jul–	20 Sep	60	0	0
C. melanotos				—	4 May 68		23 Oct	±12	20 Sep 91		
Sharp-tailed Sandpiper[e]	6	0	—	—	0	6	2 Sep–	29 Sep	1	0	0
C. acuminata							7 Nov	±27	17 Sep 96[b]		
Rock Sandpiper	18	0	—	—	2	16	19 Oct–	10 Nov	2	2	12
C. ptilocnemis					3 Apr 80[b]		5 Dec	±14	18 Dec 79[b]		
Dunlin	174	1	20 May	20 May	1	172	14 Sep–	13 Oct	70	1	2
C. alpina				—	20 May 71		9 Dec	±11	14 Oct 87		
Buff-breasted Sandpiper	7	0	—	—	0	7	15 Aug–	30 Aug	2	0	0
Tryngites subruficollis							8 Sep	±8	29 Aug 78		
Ruff	1	0	—	—	0	1	15 Oct	15 Oct	1	0	0
Philomachus pugnax								—	15 Oct 93		
Short-billed Dowitcher	1002	13	6 Apr–	3 Jun	11	989	2 Jul–	24 Aug	150	0	0
Limnodromus griseus			13 Jun	±24	13 Jun 93		19 Oct	±20	4 Sep 85		
Long-billed Dowitcher	367	2	11 May–	13 May	1	364	18 Jul–	1 Oct	41	1	0
L. scolopaceus			15 May	±3	15 May 90[b]		10 Dec	±25	22 Sep 86		
Wilson's Snipe	148	6	3 Apr–	6 May	1	141	18 Jul–	11 Oct	4	1	0
Gallinago delicata			28 May	±19	9 May 89[b]		12 Dec	±27	27 Oct 88		

(continued)

Table 1 *(Continued)*

Species	Spring					Fall				Winter	
	Total	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Total	Residents
Wilson's Phalarope *Phalaropus tricolor*	3	0	—	—	0	3	20 Jul–17 Aug	1 Aug ±14	1 17 Aug 88[b]	0	0
Red-necked Phalarope *P. lobatus*	179,227	31,174	12 Apr–12 Jun	9 May ±12	6300 30 Apr 82	148,053	19 Jul–28 Nov	1 Sep ±18	19,500 22 Aug 68	0	0
Red Phalarope *P. fulicarius*	262,901	21,682	5 Mar–12 Jun	15 May ±13	3500 8 May 96	240,734	14 Jul–19 Dec	18 Sep ±33	30,000 4 Sep 94	485	0
South Polar Skua *Stercorarius maccormicki*	24	0	—	—	0	24	26 Aug–31 Oct	7 Oct ±15	2 3 Oct 99	0	0
Pomarine Jaeger *S. pomarinus*	773	7	1 Mar–27 Apr	25 Mar ±29	2 1 Mar 90	764	3 Aug–10 Dec	8 Oct ±20	26 5 Nov 97	2	0
Parasitic Jaeger *S. parasiticus*	229	1	9 Jun	9 Jun —	1 9 Jun 95	227	20 Aug–22 Nov	30 Sep ±19	18 2 Oct 97	1	0
Long-tailed Jaeger *S. longicaudus*	14	1	29 Apr	29 Apr —	1 29 Apr 71	13	24 Aug–23 Oct	7 Sep ±41	1 11 Oct 99[b]	0	0
Laughing Gull *Larus atricilla*	2	1	2 Jun	2 Jun —	1 3 Jun 88[b]	1	3 Aug	3 Aug —	1 3 Aug 77	0	0
Franklin's Gull *L. pipixcan*	2	1	19 May	19 May —	1 19 May 91	1	4 Sep	4 Sep —	1 4 Sep 83	0	0
Bonaparte's Gull *L. philadelphia*	40,139	37,516	2 Mar–28 May	24 Apr ±6	30,000 26 Apr 70	2597	28 Sep–19 Dec	6 Nov ±9	475 27 Oct 91	26	0
Heerman's Gull *L. heermanni*	17,789	288	2 Mar–14 Jul	15 Apr ±65	40 20 Jun 97	17,249	15 Jul–19 Dec	2 Oct ±30	820 9 Aug 83	252	42
Mew Gull *L. canus*	968	43	1 Mar–9 May	17 Mar ±14	3 24 Mar 85[b]	725	31 Aug–19 Dec	8 Nov ±19	50 14 Oct 70	200	18
Ring-billed Gull *L. delawarensis*	160	20	3 Mar–14 Jul	22 Apr ±49	1 18 Apr 93[b]	127	30 Jul–15 Dec	18 Oct ±31	6 5 Oct 68[b]	13	0
California Gull *L. californicus*	53,725	1189	1 Mar–14 Jul	2 Apr ±25	250 27 Mar 90	51,376	16 Jul–19 Dec	26 Oct ±31	2500 7 Nov 97	1160	3

Herring Gull *L. argentatus*	9763	2187[c,f]	1 Mar– 12 Jul	19 Mar ±14	125 4 Mar 77	3171[c]	19 Aug– 19 Dec	21 Nov ±20	120 7 Dec 96	4405[c]	563
Thayer's Gull *L. thayeri*	470	90[c]	1 Mar– 30 May	19 Mar ±15	8 10 Mar 91	222[c]	2 Jul– 19 Dec	18 Nov ±20	8 31 Oct 85	158[c]	2
Glaucous-winged Gull *L. glaucescens*	17,395	4012[c,f]	1 Mar– 4 Jul	18 Mar ±14	350 13 Mar 94	4670[c]	20 Jul– 19 Dec	30 Nov ±23	440 18 Dec 79	8713[c]	1796
Glaucous Gull *L. hyperboreus*	59	18[c]	2 Mar– 6 May	20 Mar ±18	3 8 Mar 97[b]	10[c]	24 Oct– 15 Dec	20 Nov ±17	1 21 Nov 98[b]	31[c]	4
Sabine's Gull *Xema sabini*	1939	16	26 Mar– 16 Jun	14 May ±18	10 18 May 77	1923	20 Aug– 11 Nov	13 Sep ±12	600 22 Sep 96	0	0
Black-legged Kittiwake *Rissa tridactyla*	28,168	22,903	1 Mar– 1 Jun	16 Mar ±11	4000 4 Mar 76	1315	16 Aug– 19 Dec	12 Nov ±12	450 19 Nov 70	3950	0
Caspian Tern *Sterna caspia*	33	8	26 May– 9 Jul	16 Jun ±16	2 13 Jun 89[b]	25	15 Jul– 10 Oct	27 Aug ±26	3 17 Jul 83[b]	0	0
Elegant Tern *S. elegans*	2933	0	—	—	0	2933	2 Aug– 14 Nov	27 Sep ±16	671 28 Sep 97	0	0
Common Tern *S. hirundo*	12	0	—	—	0	12	31 Aug– 28 Sep	13 Sep ±9	1 5 Sep 99[b]	0	0
Arctic Tern *S. paradisaea*	13,978	1	24 May	24 May —	1 24 May 92	13,977	23 Aug– 9 Oct	6 Sep ±9	7500 31 Aug 93	0	0
Forster's Tern *S. forsteri*	1	0	—	—	0	1	28 Oct	28 Oct —	1 28 Oct 86	0	0
Thick-billed Murre[a] *Uria lomvia*	2	0	—	—	0	2	31 Oct 1 Nov	1 Nov ±1	1 1 Nov 94	0	0
Marbled Murrelet *Brachyrampus marmoratus*	3	0	—	—	0	3	11 Oct– 24 Nov	9 Nov ±25	2 24 Nov 99	0	0
Xantus's Murrelet *Synthliboramphus hypoleucus*	22	5	7 Mar– 12 May	18 Apr ±31	2 12 May 91	17	17 Jul– 16 Dec	31 Aug ±42	2 20 Jul 99[b]	0	0
Craveri's Murrelet *S. craveri*	26	0	—	—	0	26	7 Sep– 15 Nov	13 Oct ±15	10 13 Oct 98	0	0
Ancient Murrelet *S. antiquus*	692	59[c]	1 Mar– 10 Jun	27 Mar ±25	10 2 Mar 96	241[c]	16 Jul– 19 Dec	22 Nov ±30	30 11 Dec 75	392[c]	41
Horned Puffin[a] *Fratercula corniculata*	27	16	7 Mar– 22 Jun	6 May ±40	4 29 Mar 90	7	26 Sep– 2 Nov	19 Oct ±19	2 25 Oct 75	4	0

(continued)

Table 1 *(Continued)*

Species	Spring					Fall				Winter	
	Total	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Total	Residents
Rock Dove	183	89	2 Mar–14 Jul	10 May ±31	3 15 May 77[b]	85	15 Jul–16 Dec	29 Sep ±32	12 14 Sep 75	9	0
Columba livia											
Band-tailed Pigeon	373	157	24 Mar–14 Jul	27 May ±29	6 7 Jul 70[b]	214	15 Jul–11 Dec	17 Sep ±37	4 21 Oct 72	2	0
C. fasciata											
White-winged Dove	19	0	—	—	0	19	20 Jul–24 Nov	29 Sep ±28	1 7 Oct 98[b]	0	0
Zenaida asiatica											
Mourning Dove	871	192	29 Mar–14 Jul	17 May ±21	14 29 Apr 68	675	17 Jul–8 Dec	16 Sep ±23	20 3 Sep 72	4	0
Z. macroura											
Black-billed Cuckoo[a]	2	0	—	—	0	2	26 Aug–18 Oct	22 Sep ±38	1 26 Aug 87[b]	0	0
Coccyzus erythropthalmus											
Yellow-billed Cuckoo	23	10	14 Jun–7 Jul	23 Jun ±9	1 15 Jun 97[b]	13	21 Jul–7 Nov	31 Aug ±32	1 10 Oct 96[b]	0	0
C. americanus											
Barn Owl	15	1	13 Jul	13 Jul —	1 13 Jul 73	14	3 Aug–27 Oct	28 Sep ±27	5 27 Oct 99	0	4
Tyto alba											
Great Horned Owl	1	0	—	—	0	1	21 Nov	21 Nov —	1 21 Nov 70	0	0
Bubo virginianus											
Burrowing Owl	304	30	2 Mar–20 May	4 Apr ±20	6 10 Mar 97	268	28 Aug–17 Dec	9 Oct ±21	10 12 Oct 89[b]	6	72
Athene cunicularia											
Long-eared Owl	57	5[f]	6 Mar–14 Jul	31 May ±53	1 6 Mar 95[b]	52	17 Jul–26 Nov	15 Sep ±37	3 5 Aug 74[b]	0	0
Asio otus											
Short-eared Owl	261	4	16 Apr–5 Jul	3 Jun ±35	1 16 Apr 88[b]	249	16 Jul–7 Dec	13 Oct ±18	17 27 Oct 88	8	4
A. flammeus											
Northern Saw-whet Owl	20	0	—	—	0	18	20 Sep–21 Nov	27 Oct ±16	2 19 Nov 87[b]	2	0
Aegolius acadicus											
Lesser Nighthawk	52	44	18 May–14 Jul	14 Jun ±17	2 30 Jun 80[b]	8	19 Jul–9 Sep	10 Aug ±20	1 24 Jul 91[b]	0	0
Chordeiles acutipennis											
Common Nighthawk	4	2	2 Jun–16 Jun	9 Jun ±10	1 2 Jun 99[b]	2	8 Sep	8 Sep ±0	1 8 Sep 87[b]	0	0
C. minor											
Common Poorwill	8	0	—	—	0	8	9 Sep–31 Oct	11 Oct ±18	1 29 Oct 93	0	0
Phalaenoptilus nuttallii											

Black Swift *Cypseloides niger*	20	7	16 May– 8 Jul	11 Jun ±15	3 11 Jun 75	13	1 Aug– 9 Oct	3 Sep ±21	2 9 Aug 89[b]	0	0
Chimney Swift *Chaetura pelagica*	24	11	26 May– 9 Jul	10 Jun ±11	4 11 Jun 75	13	8 Sep– 2 Oct	21 Sep ±8	2 16 Sep 99[b]	0	0
Vaux's Swift *C. vauxi*	1412	14	16 Apr– 7 Jul	25 May ±23	3 22 May 83[b]	1398	21 Jul– 27 Oct	27 Sep ±8	102 23 Sep 85	0	0
White-throated Swift *Aeronautes saxatalis*	19	14	6 Apr– 25 May	14 May ±19	10 25 May 99	5	15 Aug– 26 Oct	8 Oct ±30	1 26 Oct 97[b]	0	0
Ruby-throated Hummingbird[a] *Archilochus colubris*	4	0	—	—	0	4	21 Aug– 12 Sep	1 Sep ±10	1 7 Sep 94[b]	0	0
Black-chinned Hummingbird *A. alexandri*	5	0	—	—	0	5	28 Aug– 27 Oct	16 Sep ±24	1 9 Sep 99[b]	0	0
Anna's Hummingbird *Calypte anna*	582	45	1 Mar– 14 Jun	25 Apr ±30	2 24 Mar 74[b]	518	21 Jul– 10 Dec	14 Oct ±22	7 9 Oct 89	19	0
Costa's Hummingbird *C. costae*	21	16	26 Mar– 13 Jul	12 May ±30	2 28 May 85	5	13 Aug– 11 Oct	16 Sep ±31	1 8 Oct 90[b]	0	0
Calliope Hummingbird *Stellula calliope*	10	8	5 Apr– 8 May	23 Apr ±14	1 13 Apr 88[b]	2	16 Sep- 5 Oct	26 Sep ±13	1 25 Sep 99[b]	0	0
Rufous Hummingbird *Selasphorus rufus*	496	291[f]	15 Feb– 4 Jun	11 Apr ±16	50 13 Apr 78[b]	205[f]	19 Jul– 11 Nov	26 Aug ±17	10 26 Aug 87[b]	0[f]	0
Allen's Hummingbird *S. sasin*	92	74[f]	5 Feb– 11 Jul	3 May ±38	3 8 May 95[b]	18[f]	23 Jul– 12 Sep	7 Aug ±12	3 3 Aug 87	0[f]	0
Total Rufous/Allen's Hummingbird *S. rufus/sasin*	681	407[f]	5 Feb– 13 Jul	17 Apr ±25	51 13 Apr 78[b]	274[f]	19 Jul– 11 Nov	24 Aug ±17	10 26 Aug 87[b]	0[f]	0
Belted Kingfisher *Ceryle alcyon*	143	23	2 Mar– 11 Jul	4 May ±40	2 14 Apr 77	116	17 Jul– 1 Dec	9 Sep ±29	4 15 Sep 74	4	24
Lewis' Woodpecker *Melanerpes lewis*	8	5	29 Apr– 8 May	4 May ±5	2 8 May 77[b]	3	6 Sep– 27 Sep	19 Sep ±9	1 12 Sep 95[b]	0	0
Acorn Woodpecker *M. formicivorus*	14	0	—	—	0	13	24 Aug– 25 Nov	4 Oct ±28	2 12 Sep 89[b]	1	0
Yellow-bellied Sapsucker *Sphyrapicus varius*	2	0	—	—	0	2	18 Oct– 29 Oct	24 Oct ±8	1 29 Oct 95[b]	0	0
Red-naped Sapsucker *S. nuchalis*	5	1	18 Jun	18 Jun —	1 20 Jun 74[b]	4	13 Sep– 13 Oct	29 Sep ±12	1 13 Sep 94[b]	0	0

(continued)

Table 1 *(Continued)*

Species	Spring					Fall				Winter	
	Total	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Total	Residents
Red-breasted Sapsucker	21	2	25 Mar–	7 Apr	1	19	27 Sep–	8 Oct	4	0	0
S. ruber			19 Apr	±18	19 Apr 81[b]		2 Nov	±9	2 Oct 68[b]		
Northern Flicker	604	90	1 Mar–	6 Apr	8	502	5 Aug–	16 Oct	18	12	32
Colaptes auratus			6 Jun	±17	4 Apr 73		18 Dec	±19	3 Oct 86		
Yellow-shafted Flicker	70	7	23 Mar–	13 Apr	3	62	13 Sep–	15 Oct	5	1	1
C. a. luteus			22 May	±20	5 Apr 84		27 Nov	±17	8 Oct 72		
Yellow × Red-shafted Flicker	59	5	26 Mar–	7 Apr	2	54	26 Sep–	16 Oct	3	0	3
intergrade			23 Apr	±12	26 Mar 82		5 Dec	±15	8 Oct 86[b]		
Red-shafted Flicker	371	65	8 Mar–	7 Apr	7	297	5 Aug–	17 Oct	14	9	28
C. a. cafer subspecies group			6 Jun	±17	4 Apr 73		18 Dec	±20	5 Oct 72		
Olive-sided Flycatcher	185	104	22 Apr–	22 May	10	81	16 Jul–	8 Sep	8	0	0
Contopus cooperi			27 Jun	±13	27 May 70[b]		27 Oct	±16	6 Sep 85		
Western Wood-Pewee	1695	1138	20 Apr–	29 May	80	557	15 Jul–	11 Sep	60	0	0
C. sordidulus			12 Jul	±12	28 May 83		19 Nov	±14	6 Sep 85		
Eastern Wood-Pewee[a]	2	1	15 Jun	15 Jun	1	1	5 Sep	5 Sep	1	0	0
C. virens				—	15 Jun 75			—	5 Sep 98		
Yellow-bellied Flycatcher[a]	6	0	—	—	0	6	25 Aug–	10 Sep	1	0	0
Empidonax flaviventris							27 Sep	±11	10 Sep 97[b]		
Alder Flycatcher[a]	2	0	—	—	0	2	27 Aug–	30 Aug	1	0	0
E. alnorum							2 Sep	±4	27 Aug 88[b]		
Willow Flycatcher	414	124	22 Apr–	2 Jun	20	290	20 Jul–	11 Sep	6	0	0
E. traillii			12 Jul	±14	5 Jun 69		29 Oct	±14	25 Aug 87[b]		
Least Flycatcher[e]	116	7	17 May–	5 Jun	1	109	17 Aug–	23 Sep	4	0	0
E. minimus			8 Jul	±16	17 May 85[b]		22 Nov	±17	26 Sep 76		
Hammond's Flycatcher	158	116	25 Mar–	8 May	12	42	1 Aug–	25 Sep	3	0	0
E. hammondii			17 Jun	±15	9 May 77		28 Oct	±16	4 Oct 86[b]		
Gray Flycatcher	99	84	18 Apr–	4 May	7	15	24 Aug–	13 Sep	2	0	0
E. wrightii			26 May	±10	21 Apr 77		14 Oct	±14	6 Sep 85		
Dusky Flycatcher	110	80	14 Apr–	9 May	8	30	1 Aug–	17 Sep	1	0	0
E. oberholseri			9 Jul	±15	9 May 69		21 Oct	±17	10 Sep 99[b]		

Western Flycatcher *E. difficilis/occidentalis*	1277	305	19 Mar– 14 Jul	20 May ±24	50 5 Jun 69[b]	972	15 Jul– 14 Nov	12 Sep ±14	65 15 Sep 93	0	0
Black Phoebe *Sayornis nigricans*	413	15	4 Mar– 17 May	2 Apr ±24	7 2 Mar 87[b]	377	21 Jul– 18 Dec	10 Oct ±22	10 31 Oct 96[b]	21	68
Eastern Phoebe *S. phoebe*	23	4	18 May– 6 Jun	29 May ±8	1 2 Jun 91[b]	19	24 Sep– 21 Nov	3 Nov ±15	1 29 Oct 99[b]	0	0
Say's Phoebe *S. saya*	263	12[f]	22 Feb– 14 May	1 Apr ±26	2 22 Feb 84	251	22 Jul– 3 Nov	24 Sep ±13	10 29 Sep 68	0[f]	4
Ash-throated Flycatcher *Myiarchus cinerascens*	214	77	16 Apr– 10 Jul	2 Jun ±17	6 12 Jun 75	136	16 Jul– 20 Nov	31 Aug ±25	7 16 Aug 87	1	0
Great-crested Flycatcher[a] *M. crinitus*	10	0	—	—	0	10	5 Sep– 13 Oct	29 Sep ±11	1 30 Sep 96[b]	0	0
Brown-crested Flycatcher *M. tyrannulus*	1	0	—	—	0	1	17 Sep	17 Sep —	1 18 Sep 83[b]	0	0
Tropical Kingbird *Tyrannus melancholicus*	14	1	6 Jun	6 Jun —	1 7 Jun 91[b]	13	7 Aug– 18 Nov	7 Oct ±29	1 23 Sep 95[b]	0	0
Cassin's Kingbird *T. vociferans*	2	1	6 Jun	6 Jun —	1 7 Jun 91[b]	1	25 Aug	25 Aug —	1 25 Aug 83	0	0
Western Kingbird *T. verticalis*	192	69	19 Mar– 14 Jul	5 May ±28	11 29 Mar 86	123	15 Jul– 20 Oct	6 Sep ±21	5 19 Oct 69	0	0
Eastern Kingbird *T. tyrannus*	42	14	12 May– 9 Jul	9 Jun ±17	2 22 May 92[b]	28	19 Jul– 28 Sep	3 Sep ±16	2 3 Sep 89	0	0
Scissor-tailed Flycatcher[a] *T. forficatus*	3	2	18 May– 27 May	23 May ±6	1 30 May 99[b]	1	30 Sep	30 Sep —	1 30 Sep 85	0	0
Brown Shrike[a] *Lanius cristatus*	1	0	—	—	0	1	20 Sep	20 Sep —	1 22 Sep 84[b]	0	0
Loggerhead Shrike *L. ludovicianus*	14	6	3 Apr– 24 May	28 Apr ±17	1 6 May 90[b]	8	26 Jul– 11 Sep	24 Aug ±15	1 10 Sep 98[b]	0	1
Northern Shrike *L. excubitor*	2	0	—	—	0	2	18 Oct– 29 Oct	24 Oct ±8	1 21 Oct 93[b]	0	0
White-eyed Vireo[a] *Vireo griseus*	2	1	4 Jun	4 Jun —	1 5 Jun 69[b]	1	28 Oct	28 Oct —	1 28 Oct 92	0	0
Bell's Vireo[d] *V.bellii*	2	0	—	—	0	2	15 Sep– 18 Sep	17 Sep ±2	1 19 Sep 93[b]	0	0

(continued)

Table 1 *(Continued)*

Species	Spring					Fall				Winter	
	Total	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Total	Residents
Yellow-throated Vireo[a] *V. flavifrons*	1	1	12 Jun	12 Jun —	1 13 Jun 69[b]	0	—	—	0	0	0
Plumbeous Vireo *V. plumbeus*	1	0	—	—	0	1	15 Sep	15 Sep —	1 15 Sep 92	0	0
Cassin's Vireo *V. cassinii*	180	57	19 Mar–5 Jul	22 Apr ±22	5 21 Apr 87	123	4 Aug–22 Oct	8 Sep ±18	7 22 Aug 70	0	0
Blue-headed Vireo[a] *V. solitarius*	31	0	—	—	0	31	9 Sep–2 Nov	30 Sep ±15	2 27 Sep 96[b]	0	0
Total Solitary Vireo *V. solitarius/cassinii/plumbeus*	213	57	19 Mar–5 Jul	22 Apr ±22	5 21 Apr 87	156	4 Aug–2 Nov	13 Sep ±19	7 22 Aug 70	0	0
Hutton's Vireo *V. huttoni*	55	14[f]	23 Feb–20 May	19 Apr ±23	2 16 Apr 83	41	18 Jul–8 Nov	23 Sep ±28	2 8 Nov 81	0[f]	0
Warbling Vireo *V. gilvus*	804	184	11 Mar–10 Jul	10 May ±18	15 9 May 90	620	21 Jul–20 Nov	13 Sep ±14	25 11 Sep 77	0	0
Philadelphia Vireo[a] *V. philadelphicus*	13	2	6 Jun–12 Jun	9 Jun ±4	1 6 Jun 89[b]	11	11 Sep–9 Nov	29 Sep ±19	1 19 Sep 95[b]	0	0
Red-eyed Vireo *V. olivaceus*	89	55	5 May–2 Jul	9 Jun ±10	3 14 Jun 98	34	18 Jul–6 Oct	12 Sep ±17	2 12 Sep 95[b]	0	0
Yellow-green Vireo[a] *V. flavoviridis*	6	0	—	—	0	6	29 Sep–30 Oct	19 Oct ±11	1 17 Oct 94[b]	0	0
Clark's Nutcracker *Nucifraga columbiana*	4	0	—	—	0	4	28 Sep–27 Oct	10 Oct ±12	1 12 Oct 86[b]	0	0
Common Raven *Corvus corax*	2	1	18 Apr	18 Apr —	1 18 Apr 72	1	4 Oct	4 Oct —	1 1 Oct 95	0	0
Horned Lark *Eremophila alpestris*	153	10	1 Mar–21 Jun	21 Apr ±45	2 6 Mar 78[b]	143	13 Sep–19 Dec	23 Oct ±16	16 16 Oct 81	0	0
Purple Martin *Progne subis*	43	6	28 May–17 Jun	10 Jun ±8	1 10 Jun 77[b]	37	11 Aug–4 Oct	5 Sep ±11	4 3 Sep 96 [b]	0	0
Tree Swallow *Tachycineta bicolor*	164	94[f]	8 Feb–8 Jul	4 Apr ±32	11 27 Mar 82[b]	70	20 Jul–8 Dec	6 Oct ±30	7 26 Oct 98	0[f]	0

Violet-green Swallow *T. thalassina*	1054	69[d,f]	3 Feb– 11 Jul	13 Apr ±35	10 25 May 99	985	20 Jul– 18 Dec	7 Oct ±13	100 4 Oct 81	0[f]	0
Northern Rough-winged Swallow *Stelgidopteryx serripennis*	282	27[f]	9 Mar– 19 Jun	21 May ±25	4 12 Jun 74	255	19 Jul– 4 Oct	31 Aug ±14	15 8 Sep 72	0	0
Bank Swallow *Riparia riparia*	48	14	3 May– 15 Jun	20 May ±12	2 17 May 84[b]	34	17 Aug– 27 Oct	23 Sep ±26	12 19 Oct 98	0	0
Cliff Swallow *Petrochelidon pyrrhonota*	163	23	14 Apr– 22 Jun	20 May ±20	3 9 May 76[b]	140	17 Jul– 8 Nov	17 Sep ±24	10 14 Aug 97	0	0
Barn Swallow *Hirundo rustica*	809	232	5 Apr– 8 Jul	18 May ±19	20 25 May 99	577	21 Jul– 12 Nov	20 Sep ±18	49 28 Sep 98	0	0
Red-breasted Nuthatch *Sitta canadensis*	1103	34	12 Apr– 8 Jul	22 May ±21	3 7 May 78	1069	16 Jul– 6 Dec	26 Sep ±20	75 15 Sep 69	0	0
White-breasted Nuthatch *S. carolinensis*	2	1	15 May	15 May —	1 15 May 79	1	10 Oct	10 Oct —	1 10 Oct 69[b]	0	0
Pygmy Nuthatch *S. pygmaea*	1	0	—	—	0	1	6 Aug	6 Aug —	1 6 Aug 69	0	0
Brown Creeper *Certhia americana*	143	2	14 Apr– 13 Jun	14 May ±42	1 18 Apr 78[b]	141	27 Sep– 24 Nov	26 Oct ±9	8 19 Oct 86[b]	0	0
Rock Wren[d] *Salpinctes obsoletus*	263	29	4 Mar– 26 Jun	25 Apr ±29	9 13 Jun 71	233	19 Aug– 26 Nov	2 Oct ±19	12 11 Nov 72[b]	1	74
Bewick's Wren *Thryomanes bewickii*	3	0	—	—	0	3	2 Oct– 2 Nov	16 Oct ±16	1 19 Dec 81[b]	0	1
House Wren *Troglodytes aedon*	184	41	11 Mar– 13 Jul	2 May ±35	2 25 Mar 92	143	15 Jul– 30 Oct	13 Sep ±22	3 28 Sep 94[b]	0	3
Winter Wren *T. troglodytes*	185	23	7 Mar– 20 Jun	14 Apr ±27	2 16 Apr 99	157	25 Jul– 1 Dec	26 Sep ±22	3 21 Oct 72	5	2
Marsh Wren *Cistothorus palustris*	33	3	1 Apr– 8 Jun	16 May ±39	1 8 Jun 92[b]	30	15 Aug– 4 Nov	28 Sep ±19	2 3 Oct 96[b]	0	0
Golden-crowned Kinglet *Regulus satrapa*	1192	101	27 Feb– 27 Jun	31 Mar ±19	18 16 Mar 74	1091	17 Sep– 14 Dec	16 Oct ±13	40 6 Oct 93[b]	0	0
Ruby-crowned Kinglet *R. calendula*	4422	1472	7 Mar– 30 Jun	13 Apr ±16	225 16 Apr 83	2939	26 Jul– 19 Dec	11 Oct ±14	200 30 Oct 91[b]	11	7
Lanceolated Warbler[a,d] *Locustella lanceolata*	1	0	—	—	0	1	11 Sep	11 Sep —	1 12 Sep 95[b]	0	0

(continued)

Table 1 *(Continued)*

Species	Spring					Fall				Winter	
	Total	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Total	Residents
Dusky Warbler[a] *Phylloscopus fuscatus*	2	0	—	—	0	2	27 Sep–14 Oct	6 Oct ±10	1 14 Oct 87[b]	0	0
Blue-gray Gnatcatcher *Polioptlia caerulea*	28	8	19 Mar–2 May	9 Apr ±17	2 9 Apr 92[b]	20	13 Aug–6 Nov	17 Sep ±19	1 5 Oct 99[b]	0	0
Red-flanked Bluetail[a] *Tarsiger cyanurus*	1	0	—	—	0	1	1 Nov	1 Nov —	1 1 Nov 89	0	0
Northern Wheatear[a] *Oenanthe oenanthe*	3	1	11 Jun	11 Jun —	1 11 Jun 71	2	26 Sep–6 Nov	17 Oct ±29	1 26 Sep 92[b]	0	0
Western Bluebird *Sialia mexicana*	2	1	1 Apr	1 Apr —	1 2 Apr 88[b]	1	14 Oct	14 Oct —	1 15 Oct 87[b]	0	0
Mountain Bluebird *S. currucoides*	20	4	3 Apr–16 Jun	30 Apr ±33	1 13 Apr 75[b]	15	12 Oct–26 Nov	2 Nov ±12	3 15 Nov 86	1	0
Townsend's Solitaire[e] *Myadestes townsendi*	28	4	12 Apr–5 Jun	6 May ±23	1 9 May 94[b]	19	11 Sep–3 Nov	10 Oct ±16	2 30 Sep 98[b]	5	0
Veery[a] *Catharus fuscescens*	3	1	28 May	28 May —	1 28 May 81	2	26 Sep–20 Oct	8 Oct ±17	1 29 Sep 85[b]	0	0
Gray-cheeked Thrush[a] *C. minimus*	13	2	28 May–11 Jun	4 Jun ±10	1 11 Jun 75[b]	11	10 Sep–17 Oct	26 Sep ±11	2 3 Oct 70	0	0
Swainson's Thrush *C. ustulatus*	1752	198	17 Apr–12 Jul	24 May ±13	35 28 May 71	1554	26 Aug–29 Nov	24 Sep ±11	60 22 Sep 93[b]	0	0
Hermit Thrush *C. guttatus*	2694	480	1 Mar–2 Jul	25 Apr ±20	25 11 May 71[b]	2149	1 Sep–18 Dec	9 Oct ±16	350 2 Oct 72	65	21
American Robin *Turdus migratorius*	1561	270	1 Mar–27 Jun	1 Apr ±22	40 4 Apr 73	829[f]	21 Jul–19 Dec	15 Nov ±22	74 23 Nov 96	462	10
Varied Thrush *Ixoreus naevius*	686	156	2 Mar–15 Jun	9 Apr ±24	22 4 Apr 73	490	24 Sep–19 Dec	2 Nov ±20	30 20 Oct 72	40	1
Gray Catbird[a] *Dumetella carolinensis*	12	3	29 May–24 Jun	15 Jun ±15	1 23 Jun 91[b]	9	25 Sep–31 Oct	12 Oct ±14	2 2 Oct 94	0	0
Northern Mockingbird *Mimus polyglottos*	225	60	3 Apr–10 Jul	1 Jun ±27	2 21 Jun 82[b]	164	15 Jul–23 Nov	8 Sep ±31	4 10 Aug 74	1	0

Sage Thrasher	70	11	19 Apr–23 Jun	24 May ±20	1 10 May 94[b]	58	12 Aug–13 Nov	4 Oct ±19	3 3 Oct 84	1	0
Oreoscoptes montanus											
Brown Thrasher	23	9	1 May–2 Jul	3 Jun ±19	1 3 Jun 98[b]	14	22 Sep–10 Nov	17 Oct ±14	2 9 Oct 74	0	1
Toxostoma rufum											
Bendire's Thrasher	6	4	17 Apr–14 Jul	4 Jun ±40	1 6 Jul 92[b]	2	21 Aug–2 Sep	27 Aug ±8	1 22 Aug 76[b]	0	0
T. bendirei											
European Starling[d]	59,577	178	1 Mar–14 Jul	11 Apr ±43	140 8 Mar 76	56,134	15 Jul–19 Dec	7 Nov ±19	3000 14 Dec 96	3265	3150
Sturnus vulgaris											
Yellow Wagtail[a]	2	0	—	—	0	2	12 Sep–21 Sep	17 Sep ±6	1 12 Sep 99[b]	0	0
Motacilla flava											
White Wagtail[a]	1	0	—	—	0	1	10 Oct	10 Oct —	1 10 Oct 74	0	0
M. alba											
Olive-backed Pipit[a,d]	1	0	—	—	0	1	26 Sep	26 Sep —	1 29 Sep 98[b]	0	0
Anthus hodgsoni											
Red-throated Pipit[e]	31	0	—	—	0	31	20 Sep–3 Nov	8 Oct ±12	3 5 Oct 91	0	0
A. cervinus											
American Pipit	4125	23[f]	5 Mar–3 Jul	28 Apr ±20	2 25 Apr 89[b]	4098	6 Sep–19 Dec	20 Oct ±16	110 27 Oct 88	4	0
A. rubescens											
Sprague's Pipit[a]	3	0	—	—	0	3	1 Oct–16 Oct	9 Oct ±8	1 16 Oct 87[b]	0	0
A. spragueii											
Bohemian Waxwing	1	0	—	—	0	1	28 Nov	28 Nov —	1 28 Nov 68	0	0
Bombycilla garrulus											
Cedar Waxwing	1245	112	4 May–20 Jun	28 May ±9	10 30 May 82	1120	16 Jul–19 Dec	10 Oct ±23	75 24 Oct 88	13	0
B. cedrorum											
Phainopepla	5	0	—	—	0	5	1 Sep–26 Sep	14 Sep ±10	1 22 Sep 97[b]	0	0
Phainopepla nitens											
Blue-winged Warbler[a]	1	1	24 May	24 May —	1 25 May 92[b]	0	—	—	0	0	0
Vermivora pinus											
Golden-winged Warbler[a]	6	3	3 Jun–5 Jul	19 Jun ±16	1 3 Jun 91[b]	3	2 Sep–29 Sep	15 Sep ±14	1 30 Sep 98[b]	0	0
V. chrysoptera											
Brewster's Warbler[a]	1	1	6 Jun	6 Jun —	1 6 Jun 91	0	—	—	0	0	0
V. pinus x chrysoptera											
Tennessee Warbler	346	151	22 Apr–17 Jul	1 Jun ±23	10 26 May 82	195	18 Aug–16 Dec	1 Oct ±23	7 12 Sep 77	0	0
V. peregrina											

(continued)

Table 1 *(Continued)*

Species	Spring					Fall				Winter	
	Total	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Total	Residents
Orange-crowned Warbler	1915	1228[f]	19 Feb–	28 Apr	175	687[f]	16 Jul–	21 Sep	18	0[f]	3
V. celata			7 Jul	±18	30 Apr 71		23 Dec	±23	2 Oct 84		
Nashville Warbler	361	63	9 Apr–	10 May	3	298	31 Jul–	6 Oct	4	0	0
V. ruficapilla			23 Jun	±18	28 Apr 68		11 Dec	±25	2 Oct 96[b]		
Virginia's Warbler	40	6	13 May–	26 May	2	34	16 Aug–	21 Sep	3	0	0
V. virginiae			17 Jun	±13	13 May 75		2 Nov	±16	1 Oct 68		
Lucy's Warbler	7	0	—	—	0	7	5 Sep–	23 Oct	1	0	0
V. luciae							20 Nov	±28	27 Nov 99[b]		
Northern Parula[e]	41	34	29 Apr–	3 Jun	3	7	9 Sep–	22 Sep	1	0	0
Parula americana			6 Jul	±16	12 Jun 85[b]		6 Oct	±12	10 Sep 88[b]		
Yellow Warbler	2586	454	14 Apr–	21 May	60	2132	16 Jul–	12 Sep	46	0	0
Dendroica petechia			27 Jun	±12	17 May 85		13 Nov	±14	10 Sep 95		
Chestnut-sided Warbler[e]	224	42	1 May–	8 Jun	3	182	2 Sep–	22 Sep	7	0	0
D. pensylvanica			7 Jul	±12	24 May 92[b]		3 Nov	±11	24 Sep 76		
Magnolia Warbler[e]	279	115	12 May–	9 Jun	8	164	22 Aug–	26 Sep	4	0	0
D. magnolia			4 Jul	±9	12 Jun 75[b]		9 Nov	±16	7 Sep 86		
Cape May Warbler[e]	60	29	26 May–	12 Jun	3	31	9 Sep–	29 Sep	2	0	0
D. tigrina			30 Jun	±9	19 Jun 77[b]		31 Oct	±14	22 Sep 79[b]		
Black-throated Blue Warbler[e]	105	0	—	—	0	105	4 Sep–	10 Oct	3	0	0
D. caerulescens							9 Nov	±12	14 Oct 87[b]		
Yellow-rumped Warbler	8071	1925[f]	1 Mar–	17 Apr	295	5709[f]	15 Jul–	19 Oct	185	437	77
D. coronata			13 Jul	±19	30 Apr 71		19 Dec	±18	30 Sep 98		
Audubon's Warbler	4547	1592	1 Mar–	16 Apr	250	2810[f]	15 Jul–	14 Oct	175	145	26
D. c. auduboni subspecies group			13 Jul	±17	30 Apr 71		19 Dec	±18	30 Sep 98		
Audubon's × Myrtle intergrade	86	11	25 Mar–	11 Apr	4	72	7 Sep–	17 Oct	3	3	1
			8 May	±16	26 Mar 69		3 Dec	±18	24 Oct 88		
Myrtle Warbler	3106	267[f]	1 Mar–	30 Apr	45	2688	7 Sep–	23 Oct	130	151	44
D. c. coronata subspecies group			18 Jul	±23	30 Apr 71		19 Dec	±16	24 Oct 88		
Black-throated Gray Warbler	487	56	22 Mar–	21 May	6	431	26 Jul–	20 Sep	12	0	1
D. nigrescens			3 Jun	±17	21 Apr 82		30 Nov	±19	18 Sep 94[b]		

Golden-cheeked Warbler[a]	1	0	—	—	0	1	9 Sep	9 Sep	1	0	0
D. chrysoparia								—	9 Sep 71		
Black-throated Green Warbler[e]	40	19	9 May–	3 Jun	3	21	3 Sep–	12 Oct	1	0	0
D. virens			18 Jun	±13	24 May 83		23 Nov	±24	17 Nov 97[b]		
Townsend's Warbler	2078	878	28 Mar–	11 May	75	1198	3 Aug–	17 Sep	30	2	1
D. townsendi			13 Jun	±11	8 May 69		22 Dec	±21	3 Sep 96		
Townsend's × Hermit Warbler	3	1	17 Apr	17 Apr	1	2	24 Sep–	26 Sep	1	0	0
D. townsendi × occidentalis				—	17 Apr 74		28 Sep	±3	29 Sep 90[b]		
Hermit Warbler	335	72	15 Apr–	8 May	5	263[f]	21 Jul–	31 Aug	8	0	0
D. occidentalis			27 May	±9	10 May 90		20 Nov	±19	9 Aug 73[b]		
Blackburnian Warbler[e]	91	6	31 May–	13 Jun	1	85	31 Aug–	29 Sep	3	0	0
D. fusca			9 Jul	±14	12 Jun 89[b]		30 Oct	±16	25 Sep 76		
Yellow-throated Warbler[a]	5	3	2 May–	4 Jun	1	2	16 Sep–	4 Oct	1	0	0
D. dominica			8 Jul	±34	7 May 80[b]		21 Oct	±25	21 Oct 86[b]		
Pine Warbler[a,d]	3	0	—	—	0	3	16 Oct–	28 Oct	1	0	0
D. pinus							18 Nov	±18	19 Nov 87[b]		
Prairie Warbler[e]	58	0	—	—	0	58	13 Aug–	20 Sep	3	0	0
D. discolor							22 Nov	±23	15 Sep 91[b]		
Palm Warbler	1481	37	14 Apr–	2 Jun	4	1444	31 Aug–	17 Oct	47	0	7
D. palmarum			3 Jul	±21	1 Jul 80		11 Dec	±16	9 Oct 93		
Bay-breasted Warbler[e]	64	31	23 May–	10 Jun	2	33[f]	22 Jul–	27 Sep	3	0	0
D. castanea			29 Jun	±10	21 Jun 82[b]		25 Oct	±16	15 Sep 93		
Blackpoll Warbler	698	57	6 May–	11 Jun	2	641[f]	22 Jul–	22 Sep	23	0	0
D. striata			12 Jul	±17	10 Jul 93[b]		16 Nov	±12	27 Sep 74		
Cerulean Warbler[a]	1	0	—	—	0	1	23 Oct	23 Oct	1	0	0
D. cerulea								—	24 Oct 81[b]		
Black-and-white Warbler	126	63	18 Apr–	1 Jun	5	63	11 Aug–	18 Sep	2	0	0
Mniotilta varia			9 Jul	±17	6 Jun 75		11 Nov	±16	18 Sep 94[b]		
American Redstart	527	89	5 May–	11 Jun	3	438	4 Aug–	19 Sep	15	0	0
Setophaga ruticilla			7 Jul	±11	6 Jun 92[b]		8 Nov	±14	15 Sep 75		
Prothonotary Warbler[a]	2	0	—	—	0	2	12 Sep–	3 Oct	1	0	0
Protonotaria citrea							23 Oct	±29	23 Oct 89[b]		
Worm-eating Warbler[a]	11	8	7 May–	3 Jun	1	3	21 Sep–	6 Oct	1	0	0
Helmitheros vermivorus			20 Jun	±13	7 Jun 92[b]		16 Oct	±13	24 Sep 94[b]		

(continued)

Table 1 *(Continued)*

Species	Spring					Fall				Winter	
	Total	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Total	Residents
Ovenbird[e]	337	200	9 May–21 Jul	12 Jun ±12	6 16 Jun 88	137	19 Aug–8 Nov	22 Sep ±14	4 17 Sep 99[b]	0	0
Seiurus aurocapillus											
Northern Waterthrush	90	6	20 May–27 Jun	6 Jun ±14	1 23 May 91[b]	84	26 Jul–27 Oct	12 Sep ±17	2 10 Sep 95[b]	0	0
S. noveboracensis											
Louisiana Waterthrush[a]	1	0	—	—	0	1	2 Jun	2 Jun —	1 3 Jun 91[b]	0	0
S. motacilla											
Kentucky Warbler[a]	22	17[a,f]	4 May–14 Jul	2 Jun ±20	3 16 May 92[b]	5	27 Jul–1 Oct	7 Sep ±25	1 27 Jul 95 [b]	0	0
Oporornis formosus											
Connecticut Warbler[a]	47	3	16 Jun–19 Jun	18 Jun ±2	1 16 Jun 90[b]	44	1 Sep–18 Oct	22 Sep ±11	3 23 Sep 74	0	0
O. agilis											
Mourning Warbler[a]	54	7	3 Jun–30 Jun	13 Jun ±9	1 13 Jun 98[b]	47	27 Aug–20 Oct	17 Sep ±13	3 8 Sep 89[b]	0	0
O. philadelphia											
MacGillivray's Warbler	432	91	6 Apr–23 Jun	16 May ±12	10 9 May 69[b]	341	23 Jul–20 Oct	5 Sep ±16	6 10 Sep 95[4]	0	0
O. tolmiei											
Common Yellowthroat	1373	536[f]	27 Feb–14 Jul	17 May ±29	16 19 Mar 92	837	15 Jul–17 Nov	22 Sep ±15	16 25 Sep 94[b]	0[f]	0
Geothlypis trichas											
Hooded Warbler[e]	29	24	5 May–1 Jul	1 Jun ±15	3 7 May 92	5	1 Sep–11 Oct	27 Sep ±15	1 11 Oct 89[b]	0	0
Wilsonia citrina											
Wilson's Warbler	4403	3226	18 Mar–28 Jun	13 May ±11	500 8 May 69	1177	13 Jul–5 Nov	3 Sep ±17	35 10 Sep 95	0	0
W. pusilla											
Canada Warbler[e]	51	15	24 May–29 Jun	11 Jun ±9	1 12 Jun 98[b]	36	8 Aug–26 Oct	17 Sep ±18	2 12 Sep 99[b]	0	0
W. canadensis											
Red-faced Warbler[a]	1	0	—	—	0	1	25 Aug	25 Aug —	1 25 Aug 92	0	0
Cardellina rubrifrons											
Yellow-breasted Chat	90	34	14 Apr–22 Jun	12 May ±14	2 20 May 76[b]	56	12 Aug–25 Oct	13 Sep ±16	3 26 Aug 97[b]	0	0
Icteria virens											
Hepatic Tanager[e]	2	1	22 May	22 May —	1 22 May 77	1	11 Nov	11 Nov —	1 11 Nov 79	0	0
Piranga flava											
Summer Tanager	29	17	15 May–14 Jul	8 Jun ±17	2 14 Jul 92	12	24 Sep–31 Oct	20 Oct ±11	1 22 Oct 98[b]	0	0
P. rubra											

Scarlet Tanager[a]	6	1	18 Jun	18 Jun	1	5	29 Sep–	27 Oct	1	0	0
P. olivacea				—	22 Jun 80[b]		26 Nov	±21	24 Oct 91[b]		
Western Tanager	713	214	15 Apr–	18 May	30	499	18 Jul–	10 Sep	12	0	0
P. ludoviciana			8 Jul	±13	8 May 69		25 Nov	±17	8 Sep 72		
Green-tailed Towhee	31	8	3 May–	23 May	1	23	24 Aug–	19 Sep	1	0	0
Pipilo chlorurus			26 Jun	±19	13 May 92[b]		11 Nov	±20	8 Nov 99[b]		
Spotted Towhee	582	37[f]	23 Feb–	15 Apr	4	545	29 Aug–	6 Oct	125	0[f]	0
P. maculatus			13 Jun	±23	4 Apr 73		20 Dec	±12	4 Oct 72[b]		
Cassin's Sparrow[a]	11	4	2 Jun–	18 Jun	1	7	13 Sep–	26 Sep	2	0	0
Aimophila cassinii			11 Jul	±17	6 Jul 82[b]		15 Oct	±11	30 Sep 85[b]		
Rufous-crowned Sparrow	1	0	—	—	0	1	29 Nov	29 Nov	1	0	1
A. ruficeps								—	31 Dec 99[b]		
American Tree Sparrow	76	17	28 Mar–	20 May	2	58	28 Sep–	25 Oct	3	1	0
Spizella arborea			28 Jun	±27	24 May 77		28 Nov	±16	21 Oct 83[b]		
Chipping Sparrow	1920	298	16 Mar–	10 May	55	1621	15 Jul–	18 Sep	50	1	0
S. passerina			13 Jul	±20	30 Apr 71		30 Nov	±21	2 Oct 72		
Chipping × Clay-col. Sparrow[d]	1	0	—	—	0	1	13 Sep	13 Sep	1	0	0
S. passerina × pallida								—	16 Sep 91[b]		
Chipping × Brewer's Sparrow[d]	1	0	—	—	0	1	26 Oct	26 Oct	1	0	0
S. passerina × breweri								—	28 Oct 88[b]		
Clay-colored Sparrow[e]	547	43	29 Apr–	30 May	3	504	15 Aug–	30 Sep	10	0	1
S. pallida			22 Jun	±13	31 May 75		8 Dec	±19	28 Sep 89		
Brewer's Sparrow	186	38	21 Apr–	26 May	2	148	22 Jul–	18 Sep	8	0	0
S. breweri			10 Jul	±17	21 May 78		15 Nov	±21	29 Sep 74[b]		
Field Sparrow[a]	1	1	17 Jun	17 Jun	1	0	—	—	0	0	0
S. pusilla				—	9 Jul 69[b]						
Black-chinned Sparrow	3	1	7 May	7 May	1	2	30 Aug–	6 Sep	1	0	0
S. atrogularis				—	7 May 94		13 Sep	±10	13 Sep 93[b]		
Vesper Sparrow	330	25	4 Apr–	23 May	1	305	21 Jul–	28 Sep	7	0	0
Pooecetes gramineus			23 Jun	±19	16 Jun 95[b]		18 Nov	±16	6 Oct 72		
Lark Sparrow	315	30	9 Mar–	23 Apr	2	284	29 Jul–	15 Sep	8	1	0
Chondestes grammacus			28 Jun	±26	9 Apr 82[b]		13 Dec	±21	1 Oct 74		
Black-throated Sparrow	32	8	17 Apr–	20 May	2	24	18 Aug–	14 Sep	2	0	0
Amphispiza bilineata			18 Jun	±19	22 May 77		10 Oct	±14	8 Sep 84		

(continued)

Table 1 *(Continued)*

Species	Spring					Fall				Winter	
	Total	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Total	Residents
Sage Sparrow *A. belli*	8	5	24 Mar–22 Apr	9 Apr ±11	1 22 Apr 82[b]	3	18 Aug–25 Oct	24 Sep ±34	1 1 Oct 81[b]	0	0
Lark Bunting *Calamospiza melanocorys*	72	1	24 May	24 May —	1 24 May 77	71	5 Aug–20 Oct	13 Sep ±14	3 18 Sep 93[b]	0	0
Savannah Sparrow *Passerculus sandwichensis*	7993	215[f]	22 Feb–19 Jun	22 Apr ±25	15 4 Apr 73	7778[f]	16 Jul–23 Dec	29 Sep ±14	1500 29 Sep 68	0[f]	1
Grasshopper Sparrow *Ammodramus savannarum*	145	26	25 Mar–2 Jul	27 May ±22	1 7 May 92[b]	119	20 Jul–29 Nov	6 Oct ±23	4 27 Sep 96[b]	0	0
Baird's Sparrow[a] *A. bairdii*	2	0	—	—	0	2	7 Sep–28 Sep	18 Sep ±15	1 7 Sep 91[b]	0	0
Le Conte's Sparrow[a,d] *A. leconteii*	8	0	—	—	0	8	11 Sep–27 Oct	1 Oct ±16	1 27 Oct 95[b]	0	0
Nelson's Sharp-tailed Sparrow *A. nelsoni*	2	0	—	—	0	2	4 Oct–27 Oct	16 Oct ±16	1 4 Oct 98[b]	0	0
Fox Sparrow *Passerella iliaca*	2483	110	3 Mar–26 May	18 Apr ±16	6 2 Mar 99[b]	2354	2 Sep–17 Dec	5 Oct ±17	225 18 Sep 93	19	58
Song Sparrow *Melospiza melodia*	79	21[f]	29 Feb–26 Jun	18 Apr ±28	2 1 Apr 90	58	7 Sep–13 Dec	10 Oct ±20	5 2 Oct 84	0[f]	4
Lincoln's Sparrow *M. lincolnii*	2304	531[f]	23 Feb–16 Jun	19 Apr ±15	40 21 Apr 87	1773	2 Sep–4 Dec	29 Sep ±12	450 3 Oct 72	0[f]	0
Swamp Sparrow *M. georgiana*	95	6	21 Apr–25 Jun	22 May ±29	1 2 Jun 86[b]	89	20 Sep–16 Nov	17 Oct ±12	5 15 Oct 87	0	0
White-throated Sparrow *Zonotrichia albicollis*	312	11	22 Apr–10 Jul	27 May ±26	1 14 Jun 98[b]	301	8 Sep–17 Dec	20 Oct ±15	7 15 Oct 87	0	0
Harris' Sparrow *Z. querula*	21	2	2 May–16 May	9 May ±10	1 2 May 73[b]	19	17 Oct–4 Dec	5 Nov ±14	2 25 Oct 77[b]	0	0
White-crowned Sparrow[d] *Z. leucophrys*	10,642	1389	4 Mar–1 Jul	19 Apr ±13	75 18 Apr 88	9229	15 Jul–19 Dec	6 Oct ±12	3000 3 Oct 72	24	26

White-cr. × Golden-cr. Sparrow *Z. leucophrys × atricapilla*	2	0	—	—	0	2	2 Oct– 13 Oct	8 Oct ±8	1 16 Oct 87[b]	0	0
Golden-crowned Sparrow *Z. atricapilla*	10,599	495	7 Mar– 12 Jun	27 Apr ±12	65 1 May 71	10,081	11 Sep– 19 Dec	7 Oct ±12	3500 2 Oct 72	23	100
Dark-eyed Junco[d] *Junco hyemalis*	4950	1356	2 Mar– 8 Jul	5 Apr ±16	420 4 Apr 73	3554	25 Jul– 19 Dec	15 Oct ±16	700 3 Oct 72[b]	40	3
Oregon Junco[d] *J. h. oreganus* subspecies group	4825	1319[e]	2 Mar– 8 Jul	5 Apr ±16	420 4 Apr 73	3466	25 Jul– 19 Dec	15 Oct ±15	700 3 Oct 72[b]	40	3
Slate-colored Junco *J. h. hyemalis* subspecies group	125	37	1 Mar– 14 Jun	1 May ±26	2 2 May 90[b]	88	24 Sep– 18 Dec	24 Oct ±18	3 15 Oct 87[b]	0	0
Lapland Longspur *Calcarius lapponicus*	552	5	4 May– 24 Jun	31 May ±22	1 5 May 87[b]	547	20 Jul– 9 Dec	16 Oct ±17	16 28 Oct 91	0	0
Chestnut-collared Longspur[e] *C. ornatus*	61	3	18 May– 16 Jul	20 Jun ±30	1 18 May 80[b]	58	20 Sep– 3 Dec	18 Oct ±14	7 14 Oct 87	0	0
Snow Bunting[a] *Plectrophenax nivalis*	25	0	—	—	0	25	22 Oct– 18 Nov	31 Oct ±8	4 28 Oct 91	0	0
Rose-breasted Grosbeak[e] *Pheucticus ludovicianus*	274	169	13 May– 14 Jul	8 Jun ±12	6 9 Jun 77[b]	105	17 Jul– 13 Nov	20 Sep ±22	3 19 Sep 93[b]	0	0
Rose-br. × Black-hd. Grosbeak *P. ludovicianus × melanocephalus*	4	1	8 Jun	8 Jun —	1 8 Jun 70	3	18 Sep– 21 Oct	2 Oct ±17	1 21 Oct 88	0	0
Black-headed Grosbeak *P. melanocephalus*	315	137	2 Apr– 14 Jul	12 May ±18	10 9 May 69[b]	178	16 Jul– 20 Nov	4 Sep ±20	4 9 Sep 80	0	0
Blue Grosbeak *Passerina caerulea*	72	11	9 May– 18 Jun	27 May ±14	1 10 Jun 94[b]	61	14 Aug– 6 Oct	7 Sep ±13	2 21 Sep 99[b]	0	0
Lazuli Bunting *P. amoena*	369	78	6 Apr– 12 Jul	16 May ±19	5 9 May 90	291	22 Jul– 8 Nov	8 Sep ±16	20 18 Sep 71	0	0
Indigo Bunting[e] *P. cyanea*	141	93	7 May– 14 Jul	8 Jun ±15	6 20 Jun 82	48	18 Jul– 13 Dec	13 Sep ±42	2 3 Sep 86	0	0
Painted Bunting[a] *P. ciris*	8	0	—	—	0	8	10 Sep– 21 Oct	25 Sep ±13	1 21 Oct 97[b]	0	0
Dickcissel *Spiza americana*	30	14	13 May– 7 Jul	4 Jun ±16	1 7 Jul 91[b]	16	24 Aug– 14 Oct	17 Sep ±17	2 3 Sep 88[b]	0	0
Bobolink *Dolichonyx oryzivorus*	216	13	24 May– 4 Jul	10 Jun ±14	1 30 Jun 95[b]	203	16 Aug– 15 Nov	22 Sep ±13	6 24 Sep 74[b]	0	0

(continued)

Table 1 *(Continued)*

Species	Spring					Fall				Winter	
	Total	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Seasonal Total	Date Range	Mean ± S.D.	High Count and Date	Total	Residents
Red-winged Blackbird *Agelaius phoeniceus*	822	49	4 Mar–11 Jun	25 Apr ±23	6 22 Apr 97[b]	769	20 Jul–18 Dec	7 Oct ±19	65 30 Sep 68	4	0
Tricolored Blackbird *A. tricolor*	99	7	8 Mar–14 Jul	30 Apr ±51	2 12 Jun 75[b]	91	21 Sep–21 Nov	14 Oct ±13	40 7 Oct 92	1	0
Western Meadowlark *Sturnella neglecta*	2516	52	9 Mar–5 Jul	27 Apr ±30	45 10 Mar 87[b]	2447	23 Jul–16 Dec	14 Oct ±17	125 4 Oct 72[b]	17	224
Yellow-headed Blackbird *Xanthocephalus xanthocephalus*	100	25	27 Apr–12 Jun	12 May ±9	3 13 May 75[b]	75	27 Jul–21 Oct	12 Sep ±20	2 11 Sep 98[b]	0	0
Rusty Blackbird[e] *Euphagus carolinus*	11	3	15 Apr–22 Apr	20 Apr ±4	1 15 Apr 85[b]	8	17 Oct–19 Nov	29 Oct ±11	1 31 Oct 91[b]	0	0
Brewer's Blackbird *E. cyanocephalus*	1246	173	16 Mar–30 Jun	25 Apr ±18	20 27 Apr 71	1060	17 Jul–18 Dec	14 Oct ±17	63 19 Oct 96	13	1
Brown-headed Cowbird *Molothrus ater*	2802	554	26 Mar–14 Jul	5 May ±14	20 7 May 78	2248	15 Jul–1 Dec	29 Aug ±21	53 26 Aug 87[b]	0	0
Orchard Oriole[e] *Icterus spurius*	53	2	11 Jun–9 Jul	25 Jun ±20	1 11 Jun 88[b]	51	14 Aug–25 Oct	18 Sep ±15	5 11 Sep 99	0	0
Hooded Oriole *I. cucullatus*	18	1	16 Apr	16 Apr —	1 18 Apr 90[b]	17	20 Jul–19 Nov	3 Sep ±29	3 21 Aug 87[b]	0	0
Bullock's Oriole *I. bullocki*	682	133	19 Mar–20 Jun	28 Apr ±17	7 21 Apr 87	549	3 Jul–27 Nov	19 Aug ±20	15 9 Aug 73	0	0
Bullock's × Baltimore Oriole *I. bullocki* × *galbula*	4	1	4 Jun	4 Jun —	1 4 Jun 70	3	20 Sep–28 Sep	23 Sep ±4	1 29 Sep 79[b]	0	0
Baltimore Oriole *I. galbula*	42	10	26 May–11 Jun	3 Jun ±6	2 26 May 70	32	5 Sep–30 Nov	2 Oct ±20	2 7 Sep 89[b]	0	0
Scott's Oriole[d] *I. parisorum*	3	0	—	—	0	3	12 Sep–10 Nov	17 Oct ±31	1 10 Nov 93[b]	0	0

Purple Finch	899	111	9 Mar–	20 Apr	7	782	18 Aug–	13 Oct	250	6	1
Carpodacus purpureus			31 May	±17	12 Apr 88		14 Dec	±14	4 Oct 72		
Cassin's Finch	9	3	12 Apr–	6 May	1	6	5 Oct–	30 Oct	2	0	0
C. cassinii			14 Jun	±34	21 Apr 87[b]		11 Dec	±23	27 Oct 96		
House Finch	771	360	9 Mar–	20 Apr	23	401	19 Jul–	21 Oct	18	10	0
C. mexicanus			1 Jul	±24	26 Apr 83		19 Dec	±23	16 Nov 90		
Red Crossbill	57	1[f]	18 Jun	18 Jun	1	55[f]	8 Sep–	26 Oct	12	1	0
Loxia curvirostra				—	18 Jun 98		6 Nov	±16	4 Nov 87		
Pine Siskin	1984	46	7 Mar–	23 Apr	8	1893	16 Jul–	14 Oct	400	45	1
Carduelis pinus			14 Jul	±36	17 Apr 74		19 Dec	±18	3 Oct 72		
Lesser Goldfinch	1414	49	29 Feb–	27 Apr	6	1357	15 Jul–	29 Sep	70	8	0
C. psaltria			11 Jul	±37	9 Mar 79		19 Dec	±21	17 Sep 99		
Lawrence's Goldfinch	25	3	8 Apr–	4 May	1	22	16 Sep–	8 Oct	6	0	0
C. lawrencei			26 May	±24	8 Apr 77		31 Oct	±13	1 Oct 74		
American Goldfinch	379	30	16 Apr–	18 May	5	349	21 Aug–	13 Oct	50	0	0
C. tristis			13 Jun	±15	15 May 75[b]		15 Nov	±15	22 Oct 96		
Evening Grosbeak	4	1	27 May	27 May	1	3	20 Sep–	30 Sep	1	0	0
Coccothraustes vespertinus				—	27 May 74		3 Oct	±9	22 Sep 79[b]		
House Sparrow[d]	247	237	9 Mar–	23 Apr	18	9	16 Jul–	14 Sep	15	1	2
Passer domesticus			1 Jul	±18	22 Apr 96		10 Dec	±43	19 Oct 97[b]		
Total	6,570,133	2,446,727				4,068,051				55,809	18,525

[a]Species formerly or currently reviewed by the CBRC. Except as noted[e] here or in the annotations following this table, all records within the CBRC's review period for the species have been accepted by the CBRC or are under review. It is possible that some records presently under review will not be accepted.

[b]Seasonal high count duplicated on more than one date; the date given is the most recent.

[c]Patterns of arrival appear to overlap two or more seasons. See notes for reinterpretations of seasonal data.

[d]See notes following the table for information on race, unusual patterns of patterns of occurrence, or individual records of interest.

[e]The totals may include one or more record not reviewed by the CBRC during the period in which the species was on the CBRC review list.

[f]Small numbers of individuals were reclassified to season using our definitions, are anomalously late or early within season, or are known immature dispersants included in the spring totals. See notes for specification of these records and, in some cases, reinterpretations of seasonal data.

Brown Pelican—See Pyle and Henderson (1991) for the algorithm used to calculate arrivals for this species; reanalysis of data from 1968–1989 using this algorithm resulted in fewer arrivals than were calculated by those authors, a difference presumably due to an error in the original calculations. The occurrence of this species is best defined by a single long peak centered around 27 September (± 51 days).

Magnificent Frigatebird—Excluding the record from 16 December 1988, this species' occurrence is best defined by a summer peak centered around 27 June (± 25 days).

Great Frigatebird—See Figure 2.

Great Blue Heron—The occurrence of this species is better defined by 207 individuals that arrived between 17 June and 25 November (mean arrival 5 September ± 27 days). The remaining five arrivals were in December (3) and March (2).

Emperor Goose—Two on 25 and 26 January 1991 provided the high count; one of these remained to 25 March 1991.

Cinnamon Teal—This species' early spring arrival pattern is best defined by the 27 individuals arriving from 30 January to 2 March (mean arrival 21 February ± 12 days).

Surf Scoter—Three arrivals between 16 and 23 July 1978 and one on 7 July 1994 were anomalous summer visitants; with these excluded the earliest fall record was 3 September.

Long-tailed Duck—The mean winter date of all records is 30 December ± 47 days.

Common Goldeneye—Four on 4 February 1988 provided the high count.

Barrow's Goldeneye—The only record for the island is for 1 January 1977.

Red-breasted Merganser—The arrival pattern of this species is perhaps more accurately represented by a single over-winter peak (mean arrival 31 December ± 46 days).

Figure 2. Adult female Great Frigatebird, Southeast Farallon Island, 14 March 1992. This was the first Great Frigatebird accepted for California and still one of only two.

Photo by Peter Pyle

American Kestrel—An arrival on 8 March 1991 was extremely early, the next earliest being on 14 June. Excluding the March record results in a mean spring arrival date of 20 June ± 6 days.

Peregrine Falcon—The occurrence patterns of the three subspecies by age and sex were detailed by Earnhart-Gold and Pyle (2001).

Lesser Golden-Plovers. After reevaluating records of the American Golden-Plover we have redesignated 16 of those listed by Pyle and Henderson (1991) as the Pacific Golden-Plover or as identified to the species pair only, on the basis of the documentation (or lack thereof) provided.

Killdeer—Twenty-eight birds on 31 December 1978 made the high count.

Herring Gull—One on 12 July 1977 was an anomalous summer arrival; the next latest spring record was 8 June. The mean winter date of all records is 16 January ± 48 days, with a high count of 200 birds on 28 February 1977.

Thayer's Gull—One on 30 May 1978 was late; the next latest spring record being from 29 April. The mean winter date of all records is 3 January ± 52 days, with a high count of 20 birds on 24 December 1976.

Glaucous-winged Gull—The mean winter date for all records is 22 January ± 42 days.

Glaucous Gull—The mean winter date for all records is 30 January ± 45 days, with a repeat high count of 3 birds on 9 March 1997.

Thick-billed Murre—The table includes a record from 29 October 1988 that was not accepted by the CBRC.

Ancient Murrelet—The mean winter date for all records is 5 January ± 44 days, with a repeat high count of 150 birds on 12 February 1996.

Long-eared Owl—One on 6 March 1993 was early, the next earliest spring record being for 21 May.

Selasphorus hummingbirds—Ten arrivals, of Allen's Hummingbirds on 5 February 1984 and 26 February 1980, Rufous Hummingbirds on 15 February 1977, 23 February 1976 and 1995, 25 February 1988, and (2 birds) 27 February 1995, and unidentified individuals of this species pair on 3 February 1976 and 27 February 1992, were considered early spring arrivals rather than winter visitants. The next earliest spring arrivals were from 2 March for the Rufous Hummingbird and 9 March for Allen's.

Eastern Wood-Pewee—The table includes a record from 5 September 1998 that was not accepted by the CBRC.

Yellow-bellied Flycatcher—The table includes a record from 25 August 1992 that was not accepted by the CBRC.

Say's Phoebe—We reclassified an individual from 22 February 1984 as an early spring migrant rather than a winter visitant. The next earliest spring arrival was 1 March. A bird present 22–24 July 1988 was an anomalous summer arrival, the next earliest fall individual arriving 30 August. Excluding the July record results in a mean fall arrival date of 24 September ± 12 days.

Great Crested Flycatcher—The table includes an individual arriving 30 September 1996 for which documentation has not been submitted to the CBRC.

Tropical Kingbird—One present 7–25 August 1973 was early. The next earliest fall individual arrived on 21 September. Excluding the August record results in a mean fall arrival date of 17 October ± 17 days.

Brown Shrike—The lone record of this species was of one on the island 20–22 September 1984, *contra* Dunn (1988) who listed it for 20 September only.

Bell's Vireo—See Figure 3.

Blue-headed Vireo—Records of this species prior to 1998 (28 in total) have not been reviewed by the CBRC.

Hutton's Vireo—We reclassified an arrival on 23 February 1985 as an early spring migrant rather than a winter visitant, although the next earliest spring migrant did not occur until 28 March. If it is considered a winter bird, the mean spring arrival date is 23 April ± 18 days.

Tree Swallow—We reclassified twelve individuals arriving between 8 and 26 February as early spring migrants rather than winter visitants. The next earliest spring migrant arrived on 2 March.

Violet-green Swallow—We reclassified eight individuals arriving between 3 and 27 February as early spring migrants rather than winter visitants. The next earliest spring record was for 1 March. The spring total includes at least two immature dispersants, which arrived on 24 June 1975 and 2 June 1989.

Northern Rough-winged Swallow—Individuals on 9 March 1979 and 27 March 1990 were exceptionally early, the next earliest spring arrival being on 28 April.

Rock Wren—DeSante and Ainley (1980) and Pyle and Henderson (1991) summarized the species' breeding status on the island through 1989. Breeding attempts by this species in 1990 and 1991 were unsuccessful, and there have been no subsequent attempts. The arrival totals do not include fledglings, although the spring high count of nine on 13 June 1971 includes five fledglings.

Lanceolated Warbler—See Hickey et al. (1996) for more information on this first California record.

Townsend's Solitaire—The high count was of three birds on 27 January 1984.

Veery—We include the single spring record from 28 May 1981 that was not accepted by the CBRC.

Gray-cheeked Thrush—The table includes two records not accepted by the CBRC: one of two birds on 3 October 1970 and a single bird on 18 September 1975.

American Robin—Individuals occurring on 21 July 1980, 25 July 1973, and 31 July 1980 were anomalous summer arrivals, the next earliest fall arrival being 19 September. The July birds excluded, the fall mean arrival date was 15 November ± 21 days.

European Starling—DeSante and Ainley (1980) and Pyle and Henderson (1991) summarized the breeding status of this species on the island through 1982, the last year in which it attempted to breed. The arrival totals do not include fledglings.

Olive-backed Pipit—See Capitolo et al. (2000) for more details of this first California record.

American Pipit—An individual recorded on 3 July 1974 represents an anomalous summer arrival, the next latest spring migrant arriving on 12 May. The July arrival excluded, the mean spring arrival date is 25 April ± 14 days. At least six pipits believed to be of the Asiatic subspecies *Anthus rubescens japonicus* occurred on Southeast Farallon Island during the 1990s. Four individuals arrived on dates spanning from 13 October to 5 November 1991. One occurred on 20 October 1995, and another was present from 12 to 15 November 1997.

Orange-crowned Warbler—We reclassified ten arrivals between 19 and 26 February and an eleventh on 23 December from winter visitants to early spring and late fall

Figure 3. Bell's Vireo, Southeast Farallon Island, 18 September 1993. Two individuals of this species arrived within three days in 1992 and represent the only records of it for the island. This one appears too green to have been the California subspecies, the Least Bell's Vireo, *Vireo bellii pusillus*.

Photo by Joe Kaplan/PRBO

Figure 4. Song Sparrow, Southeast Farallon Island, 15 October 1995. This individual was identified by measurements and plumage as the subspecies *Melospiza melodia kenaiensis*, breeding in south-central Alaska. There are no published records of this subspecies as far south as California.

Photo by Peter Pyle

migrants, respectively. The next earliest spring migrant arrived on 9 March, and the next latest fall migrant arrived on 13 December.

Yellow-rumped Warbler—A Myrtle Warbler on the island from 15 July to 10 August 1971 has been reclassified as a late spring migrant; the next latest spring arrival was 30 June. Audubon's Warblers arriving 15 July 1973, 16 July 1973 (2 birds), 28 July 1988, and 13 August 1987 were anomalous summer visitants; with these excluded the mean fall arrival date was 19 October ± 18 days for the Yellow-rumped Warbler as a whole and 15 October ± 18 days for Audubon's Warbler. The next earliest fall Audubon's Warbler arrived 6 September.

Hermit Warbler—A late fall migrant arrived on 20 November 1968; the next latest fall record was for 25 October.

Yellow-throated Warbler—The table includes two individuals not accepted by the CBRC, present 4 June 1978 and 2–7 May 1980.

Pine Warbler—We follow the CBRC in rejecting a previously accepted record from 21 September 1973. See McKee and Erickson (2002) for details.

Palm Warbler—Upon further examination of the evidence we do not consider the four records of the Yellow subspecies (*Dendroica palmarum hypochrysea*) mentioned by Pyle and Henderson (1991) to be acceptable. Remarkably, there are no documented records of this subspecies for the Farallones.

Bay-breasted Warbler—A female present from 22 to 25 July 1997 was an anomalous summer arrival. Excluding this record results in a mean fall arrival date of 27 September ± 11 days; the next earliest fall migrant arrived on 9 September.

Blackpoll Warbler—Molting adults present 22–25 July 1982, 1–16 August 1969, and 8–12 August 1973 were anomalous summer arrivals; excluding these results in a mean fall arrival date of 23 September ± 11 days. The next earliest fall date was 26 August.

Worm-eating Warbler—The table includes two individuals not accepted by the CBRC, present on 5 June 1973 and 28 May 1981.

Mourning Warbler—The table includes three individuals not accepted by the CBRC, present on 13 September 1981, 8 September 1984, and 13 June 1998. See Pyle and Henderson (1990) for a discussion of this species on the Farallones and its identification.

Connecticut Warbler—The table includes an individual not accepted by the CBRC present on 5 October 1978 and an individual for which documentation was not submitted on 4 October 1968.

Kentucky Warbler—Birds recorded on 2 June 1969 and 18 June 1976 have not been submitted to the CBRC but are included in the table.

Common Yellowthroat—We reclassified an individual banded on 27 February 1995 as an early spring migrant rather than a winter visitant. The next earliest spring arrival was 11 March.

Spotted Towhee—We reclassified an individual recorded on 23 February 1985 as an early spring migrant rather than a winter visitant. The next earliest spring migrant arrived 2 March.

Chipping, Clay-colored, and Brewer's sparrow hybrids—See Pyle and Howell (1996) for information on these hybrids and other records of *Spizella* sparrows.

Savannah Sparrow—We reclassified individuals arriving on 27 February 1992 and 22 February 1996 as early spring migrants. The next earliest spring arrival is 2 March.

An individual from 23 December 1976 has been reclassified as a late fall migrant. The next latest fall migrant arrived on 17 December.

Le Conte's Sparrow—See Pyle and Sibley (1994) for information and photographs on records of this species.

Song Sparrow—We reclassified individuals arriving on 28 February 1987 and 28 February 1995 as early spring migrants rather than winter visitants, although the next earliest individual did not occur until 26 March. If these February birds are considered as winter arrivals the mean spring arrival date was 23 April ± 23 days. See also Figure 4.

Lincoln's Sparrow—Individuals arriving on 28 February 1984, 28 February 1985, and 23 February 1997 have been classified as early spring migrants rather than winter visitants. The next earliest spring birds occurred on 1 March.

White-crowned Sparrow—See Pyle and Henderson (1991) for a breakdown of records before 1990 by subspecies.

Dark-eyed Junco—The totals for the Oregon Junco include the Pink-sided Junco (*Junco hyemalis mearnsi*), of which quite a few have been identified during the fall (approximately one per year through the 1990s), plus several others that were possibly this subspecies. There have been no records of juncos identified as the White-winged (*J. h. aikeni*) or Gray-headed (*J. h. caniceps* subspecies group).

Snow Bunting—The table includes records for six birds that were not accepted by the CBRC, of single individuals on 26 October 1972, 11 November 1975, and 17 November 1975, and three individuals on 29 October 1975. The table also includes an individual recorded on 24 October 1981 which has not been submitted to the CBRC.

Scott's Oriole—See Figure 5.

Red Crossbill—An immature male arriving on 18 June 1998 was an anomalous spring dispersant. An early fall individual arrived on 9 August 1977. The next earliest fall record was 26 September. The August record excluded, the mean fall arrival date was 27 October ± 12 days.

House Sparrow—DeSante and Ainley (1980) and Pyle and Henderson (1991) summarized the breeding status of this species on the island through 1989. Subsequently, two or three pairs nested each year from 1996 to 1999 (none from 2000 to 2002), fledging two to nine young per year. The arrival totals do not include fledged young, although the high count of 15 on 19 October 1997 includes nine juveniles.

HYPOTHETICAL SPECIES

Cook's Petrel (*Pterodroma cookii*). A bird observed from the island on 21 September 1970 was not accepted by the CBRC (Winter 1973). One observed on 15 October 1997 was thought to be this species.

Dark-rumped Petrel (*Pterodroma phaeopygia*). A record of one observed from the island on 20 May 1988 was not accepted by the CBRC (McCaskie and San Miguel 1999).

Wood Sandpiper (*Tringa glareola*). A bird observed on 20 August 1985 was not accepted by the CBRC (Dunn 1988).

Greater Pewee (*Contopus pertinax*). A bird identified to this species 1 June 1998 was not accepted by the CBRC (see Erickson and Hamilton 2001 for a photograph and comments).

Figure 5. Scott's Oriole, Southeast Farallon Island, 10 November 1993. Two Scott's Orioles arrived on Southeast Farallon in 1993, representing the species' second and third island records.

Photo by Peter Pyle

Figure 6. Black Swan, Southeast Farallon Island, 21 September 1991. This individual, presumably an escapee from captivity, was very tame, accepting hand-offered food. It died on the island on 25 September.

Photo by Peter Pyle

ESCAPED NON-NATIVE SPECIES

Black Swan (*Cygnus atratus*). An individual was present from 21 to 25 September 1991 (Figure 6).

Ringed Turtle-Dove (*Streptopelia risoria*). An individual arrived on 15 October 1983, was captured and banded, and remained until the next day.

Black-headed Parakeet (*Nandayus nenday*). One arrived on 29 September 1980.

Cutthroat Weaver (*Amadina fasciata*). One arriving on 25 September 1988 was captured and photographed.

ACKNOWLEDGMENTS

The research program on Southeast Farallon Island is conducted in cooperation with and with the support of the U.S. Fish and Wildlife Service, San Francisco Bay National Wildlife Refuge Complex, Newark, California. The Farallon Patrol also provided logistic support. The monitoring program for migrant birds has been carried out by numerous PRBO biologists and volunteers over the 32 years of data collection. We again acknowledge those listed by DeSante and Ainley (1980) and Pyle and Henderson (1991), who contributed to the collection of data from 1968 through 1989. Subsequent biologists who helped run the station and oversee the collection of data during the fall were P. Ashman, C. Alexander, S. Anderson, G. Ballard, K. Carney, D. Christian, J. Clark, K. Convery, S. Earnheart-Gold, J. Ellis, L. Gilbert, B. D. Hardesty, K. Hansen, C. Hickey, S. N. G. Howell, J. Kaplan, A. King, J. King, G. Phillips, I. Samuels. J. Sutter, P. Vernon, B. Walker, C. Wise, R. Woodard, and G. Yanega. We also like to thank the many others who collected data year round, as supervised by Farallon biologists K. Hastings, R. P. Henderson, M. Hester, E. McLaren, J. Nusbaum, K. Mills, W. J. Sydeman, and J. Walsh. This manuscript was improved greatly by comments from Richard A. Erickson, Michael A. Patten, and Bruce Peterjohn. This is PRBO contribution 960.

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Accepted 14 March 2003

THE GENERIC DISTINCTION OF PIED WOODPECKERS

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ABSTRACT: The ten species of New World four-toed woodpeckers (*scalaris*, *nuttallii*, *pubescens*, *villosus*, *stricklandi*, *arizonae*, *borealis*, *albolarvatus*, *lignarius*, and *mixtus* and the two boreal three-toed species (*arcticus* and *tridactylus*), currently combined in the genus *Picoides*, differ, in addition to the number of toes, in modifications of the skull, ribs, the belly of the pubo-ischio-femoralis muscle, head plumage, and behavior. I recommend that the generic name *Dryobates* be reinstituted for the New World four-toed woodpeckers.

There are three general morphological groups of pied woodpeckers, a group of nine four-toed species of the New World, a group of 22 four-toed species of the Old World, and a group of two three-toed species straddling both regions. I refer to these groups of pied woodpeckers beyond as the New World, Old World, and three-toed groups. The three-toed species have long been in the genus *Picoides* Lacépède, 1799, but the four-toed groups have been combined at the generic level in different ways. All four-toed pied woodpeckers were long included in the genus *Dryobates* Boie, 1826, later changed to *Dendrocopos* Koch, 1816 an earlier name (Voous 1947, A.O.U. 1947, Peters 1948). Despite the difference in number of toes, *Dendrocopos* was combined with *Picoides* because of general similarities in anatomy (Delacour 1951, Short 1971a), plumage and behavior (Short 1974a), and vocalizations (Winkler and Short 1978). The A.O.U (1976) followed this merger of the genera. On the basis of skeletal characters Rea (1983) was skeptical of the merger, but he did not provide details. On the other hand, Ouellet (1977), concluding that the two genera differ in external morphology and some behaviors and vocalizations, separated the Old World four-toed woodpeckers in *Dendrocopos* and three-toed and New World four-toed woodpeckers in *Picoides*. The A.O.U. (1987, 1998), Sibley and Monroe (1990), and most European authors (e.g., Hogstad 1978, Cramp 1985, Aulen and Lundberg 1991) followed Ouellet (1977). More recently, analysis of DNA sequences of the genes for cytochrome oxidase I, cytochrome b (Weibel and Moore 2002a), and ß-fibrinogen intron 7 (Weibel and Moore 2002b) suggest that *Picoides* (sensu Short 1982) consists of several groups of species.

In discussing the characters on which he based his classification of woodpeckers, Short (1982) commented that anatomical studies are unreliable because of the lack of analyses of various structures' functions. Burt (1930), however, had found a positive correlation between certain modifications in the skull and habits of woodpeckers. Spring (1965) concluded that the loss of the hallux and a reduced angle of cranial kinesis are probably modifications for a woodpecker's peck to deliver a blow of maximum impact. Kirby (1980) concluded that woodpeckers with wider ribs are adapted to more frequent and harder pecking than species with narrow ribs and that the pattern of increasing rib width follows that of increasing specialization in the skull in species characterized by Burt (1930).

Burt (1930) discussed as a modification in the skull of woodpeckers the meeting of the frontal bone (forehead of the cranium) and the superior processes of the premaxillary (base of the maxilla), which forms a so-called cranio-facial angle. He qualitatively ranked the three-toed pied woodpeckers as having a more acute angle than the four-toed New World species. The frontal bones of both groups, and of the distinct (Zusi and Marshall 1970) genus *Sphyrapicus*, the sapsuckers, fold toward the cranium (Burt 1930).

Another modification in the skull is the relative distance between the lateral parts of the frontal bone that bulge anteriorly and the anterior center of the bone (Figure 1). Here I summarize this distance and other measurements of the skull, with other anatomical and behavioral information, to determine differences and similarities among pied woodpeckers.

METHODS

I examined skeletons including skulls and an associated femur of 17 of the 22 species of Old World four-toed pied woodpeckers, all species of New World four-toed pied woodpeckers except the Checkered Woodpecker (*Picoides mixtus*) of South America, both species of three-toed pied

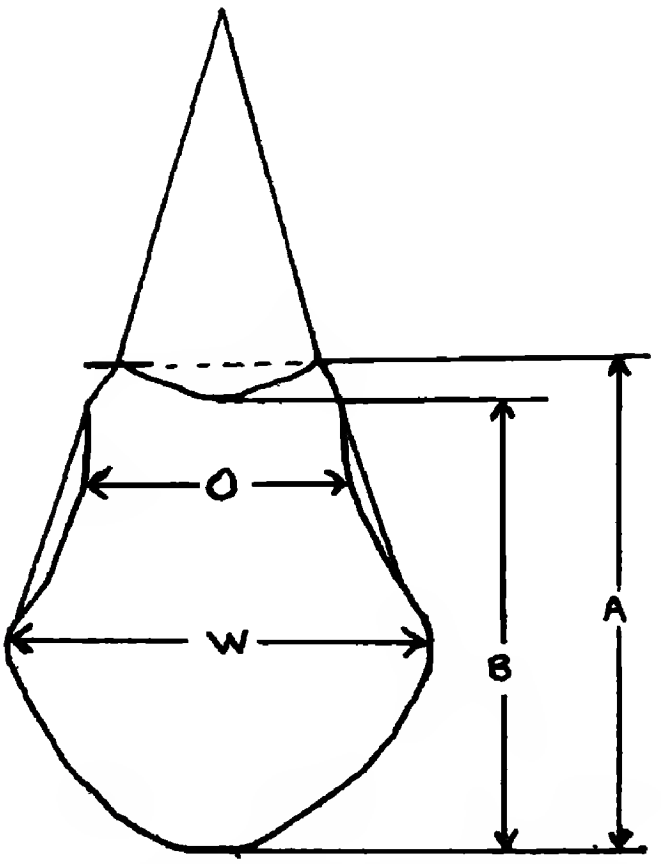

Figure 1. Diagrammatic dorsal view of a woodpecker skull showing distances measured. A, distance from the medial base of the most posterior part of the occiput to the anterior lateral corners of the frontal bone; B, distance, measured medially, from the most posterior part of the occiput to center of the anterior margin of the frontal bone. The craniofacial distance formula, normalized for the size of the bird, is expressed by $(A - B)$/femur length(100). Two measurements of widths of the skull: W, maximum width; O, width at the orbits.

woodpeckers (the Three-toed, *P. tridactylus*, and the Black-backed, *P. arcticus*), all species of *Sphyrapicus*, and three species of the African genus *Dendropicos* (sensu Short 1982) (Table 1). The last genus was included because *Picoides* and *Dendropicos* are probably closely related (Short 1971b). On each skull I measured the distance along the midline between the most anterior point of the frontal bone in its center and the most anterior (farther anterior) point of the frontal bone at its lateral corners. I did this by subtracting the length of the cranium, measured medially from the base of the occiput to the center of the most anterior part of the frontal bone (B in Figure 1), from the distance from the medial base of the occiput to the lateral corners of the most anterior part of the frontal bone (A in Figure 1). To avoid possible bias caused by the species' varying sizes (Kirby 1980, Rising and Somers 1989), I divided A – B by femur length. Thus, the formula (A – B)/femur(100) gives a value that, for brevity, I refer to as facial distance. The sexes were combined because the characters addressed in the study are not sexually dimorphic. I also compared maximum skull width (W in Figure 1) and dorsal skull width between the orbits (O in Figure 1), divided by length of femur. SYSTAT (Wilkonson 1989) was used for the statistical analyses. For the species omitted from this analysis, no skeleton including an intact skull and at least one femur was available from the numerous museums surveyed.

RESULTS AND DISCUSSION

In the three-toed pied woodpeckers the facial distance is greater than in the four-toed species. The average facial distance for both three-toed species is at least 2.5 greater than in any four-toed species, and individual variation yields only minimal overlap with only one of the four-toed species, the Old World Lesser Spotted Woodpecker (*Dendrocopos minor*) (Tables 1 and 2). The skull shapes of the two groups are distinct visually; a skull is readily identifiable as that of a three-toed or a four-toed woodpecker without the facial distance being measured (Figure 2). Facial distances of New World and Old World four-toed woodpeckers (Table 2), sapsuckers (mean 5.18, range 2.89–7.50, $n = 8$) and the available species of *Dendropicos* (mean 3.63, range 1.32–6.77, $n = 4$) are similar to one another and do not overlap those of the three-toed woodpeckers.

The width of the skull (Figure 1) in all pied woodpeckers is similar. The width of the skull of species of *Dendropicos* (0.84 to 0.95) and *Sphyrapicus* (Figure 3) is similar in both genera and narrower than in the pied species. The width of the skull at the orbits (Figure 1) is similar in the four-toed pied woodpeckers. This variable is greater in the three-toed species and in *Sphyrapicus*, whereas in *Dendropicos* it is narrower than in the other woodpeckers measured.

Principal-components analysis, based on facial distance, widths, and lengths of the skull (Figure 1) of the pied woodpeckers, revealed extensive overlap in canonical factors 1 and 2 of the Old and New World four-toed species (Figure 4). The three-toed pied woodpeckers and *Sphyrapicus*, however, differ from each other, and both differ from four-toed pied woodpeckers (Figure 4).

Table 1 Cranio-facial Distance of Adult Three- and Four-toed Pied Woodpeckers and Some Related Species

Species	*n*	Range	Mean ± SD[a]
Old World four-toed woodpeckers (*Dendrocopos*)			
Sulawesi (*temmincki*)	1		3.30
Philippine (*maculatus*)	3	3.16–5.56	4.07
Brown-capped (*nanus*)	1		4.86
Pygmy (*kizuki*)	1		5.33
Gray-capped (*canicapillus*)	2	3.82–4.69	4.23
Lesser Spotted (*minor*)	5	7.60–9.43	8.50
Fulvous-breasted (*macei*)	1		3.45
Stripe-breasted (*atratus*)	2	1.40–2.90	2.10
Yellow-crowned (*mahrattensis*)	1		7.40
Darjeeling (*darjellensis*)	1		4.16
Rufous-bellied (*hyperythrus*)	1		5.80
Middle Spotted (*medius*)	3	3.90–4.90	4.40
White-backed (*leucotos*)	1		4.09
Himalayan (*himalayensis*)	1		4.16
Sind (*assimilis*)	1		5.82
Syrian (*syriacus*)	2	5.20–6.80	6.00
Great Spotted (*major*)	5	3.89–5.33	4.80
New World four-toed species (*Dryobates*)			
Striped (*lignarius*)	1		6.34
Ladder-backed (*scalaris*)	23	2.23–5.40	4.20 ± 1.20
Nuttall's (*nuttallii*)	6	2.71–5.59	4.70
Downy (*pubescens*)	22	2.98–7.59	5.10 ± 1.30
Red-cockaded (*borealis*)	10	3.41–6.53	4.60 ± 1.81
Strickland's (*stricklandi*)[b]	9	2.55–6.01	4.90
Hairy (*villosus*)	24	2.25–7.05	5.30 ± 1.20
White-headed (*albolarvatus*)	5	4.61–8.48	7.30
Three-toed species (*Picoides*)			
Three-toed (*tridactylus*)	10	8.60–13.83	11.10 ± 1.58
Black-backed (*arcticus*)	8	10.08–13.25	11.14
Sapsuckers (*Sphyrapicus*)			
Yellow-bellied (*varius*)	3	7.32–2.89	4.45
Red-naped (*nuchalis*)	2	7.07–7.50	7.29
Red-breasted (*ruber*)	1		3.77
Williamson's (*thyroideus*)	2	3.38–6.37	4.88
African pied woodpeckers (*Dendropicos*)			
Golden-crowned (*xantholophus*)	1		4.00
Bearded (*namaquus*)	1		1.32
Cardinal (*fuscescens*)	1		6.77
Gray (*goertae*)	1		2.42

[a]Standard deviation (SD) calculated for $n > 9$.

[b]Includes Arizona Woodpecker (*arizonae*).

Table 2 Comparison of Three- and Four-toed Pied Woodpeckers

Character	Three-toed	Four-toed		Source[a]
		New World	Old World	
Cranio-facial distance[b]				
Mean	11.34	4.86	4.37	1
SD	1.39	1.34	1.00	
Range (males)	8.85–11.3	2.23–8.48	1.30–6.06	
Width of first sternal rib[c]				
Mean	14.7	11.3	12.1	2
Range	14.6–14.8	11.7–12.6	9.6–13.9	
Bellies of pubo-ischio-femoralis muscle	fused	separate	—	3
Head-turned and head-bobbing displays	lacking	present	present	4
Clutch size	2.8–3.2	3.8–4.6	—	5

[a]1. This study. Data summarized in Table 1.
2. Kirby (1980); V. C. Kirby (unpubl. data). Data from Black-backed, Three-toed, six New World four-toed, and nine palearctic four-toed woodpeckers.
3. Swierczewski and Raikow (1981). Data from Black-backed, White-headed, and Downy Woodpeckers.
4. Short (1971b).
5. Koenig (1987). Clutch sizes are ranges from mean clutch size adjusted for latitude. All North American species included.

[b]Quantities in millimeters × 100.

[c]Normalized for size of the bird by being divided by length of femur.

The first thoracic rib (Kirby 1980, V. C. Kirby unpubl. data), averages wider in the three-toed species than in the four-toed species (Table 2), and measurements (normalized for size of the bird by being expressed as a fraction of femur length) do not overlap. Other anatomical studies also suggest differences between three- and four-toed woodpeckers. Swierczewski and Raikow (1981) found that the bellies of the pubo-ischio-femoralis muscle are separate in the Downy (*P. pubescens*) and White-headed (*P. albolarvatus*) Woodpeckers, both New World species, but are fused in all other woodpeckers they compared, including the three toed species (Old World four-toed species omitted from this study). The muscle flexor perforans et perforatus digiti III is modified in the three-toed species. The three- and four-toed species differ also in several other characters related to the three-toed species' loss of the hallux (Table 2; Swierczewski and Raikow 1981).

Plumage patterns on the heads of pied woodpeckers, although species-level characters, provide useful taxonomic information (Short 1974b:40; 1976) and suggest differences of groups of species. Most male three-toed and New World four-toed woodpeckers differ in the position and extent of a red or yellow patch on the head. The patch is on the nape of most New World four-toed males but it is on the crown of the three-toed species.

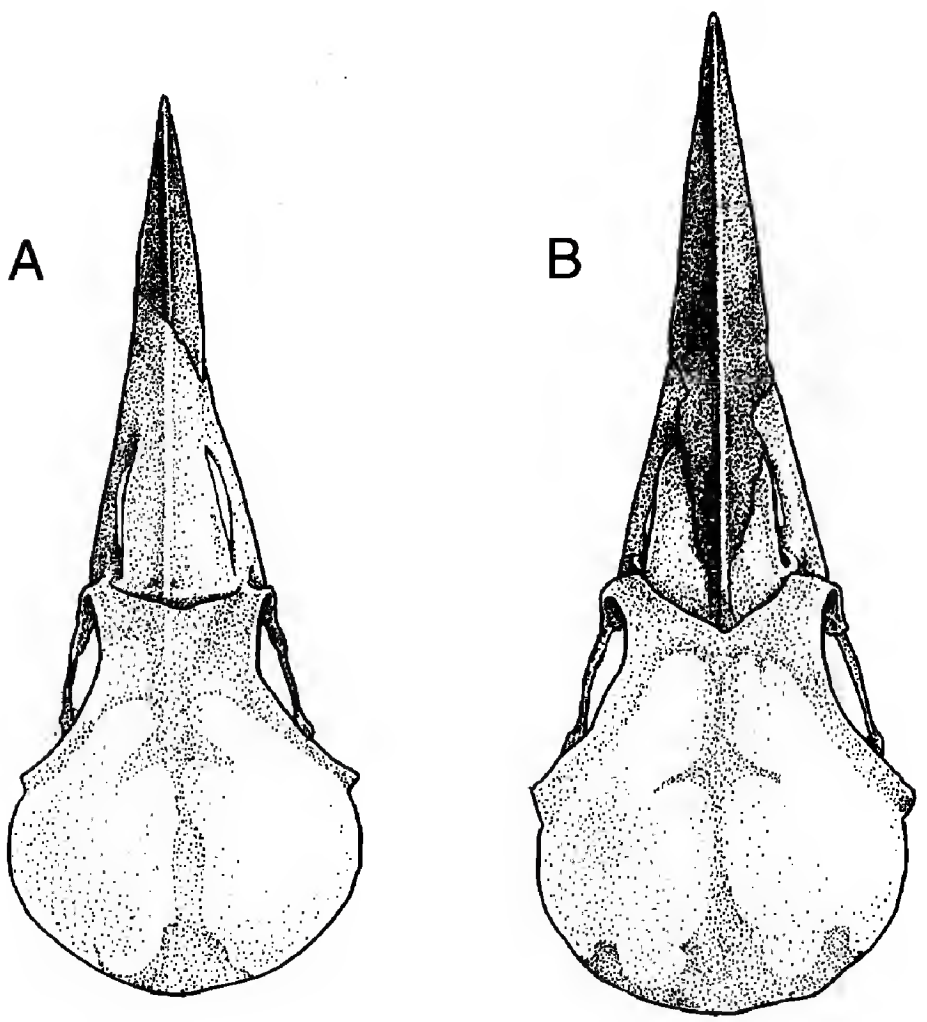

Figure 2. Dorsal views of skulls of pied woodpeckers, showing the difference in shape of forehead between the four-toed species, exemplified by a Hairy Woodpecker (A; SDNHM 41367), and the three-toed species, exemplified by a Black-backed Woodpecker (B; SDNHM 41833). The difference in the extent of dark on the maxilla is the result only of variation in the amount of ramphotheca remaining on the bill after preparation.

Illustration by Jennifer V. Zee

Because the patch is on the back of the head in four-toed woodpeckers, in defense from conspecifics, females facing out from a nest or roost cavity are at an advantage because they look like males (Kilham 1983); sexes of the three-toed species facing out from a cavity are probably more readily distinguished by conspecifics because the patch is on the top of the head. Crest-raising in woodpeckers, exposing yellow, red, black, or white in males, is used in sexual recognition and threat displays (Short 1982). Displays that expose the small red area on the nape in males of the Downy and Hairy (*P. villosus*) would seem to require frequent movements of the head; the large yellow crown in males of the three-toed species would be relatively visible by conspecifics, with or without frequent movements of the head. Short's (1982) survey of behavior of pied woodpeckers suggests, qualitatively, that the Downy and Hairy Woodpeckers display more side-to-side head movements and less frontal exposure of the head (Bill-Lowered Posture; Short 1982) than do the Three-toed or Black-backed Woodpeckers. Short's

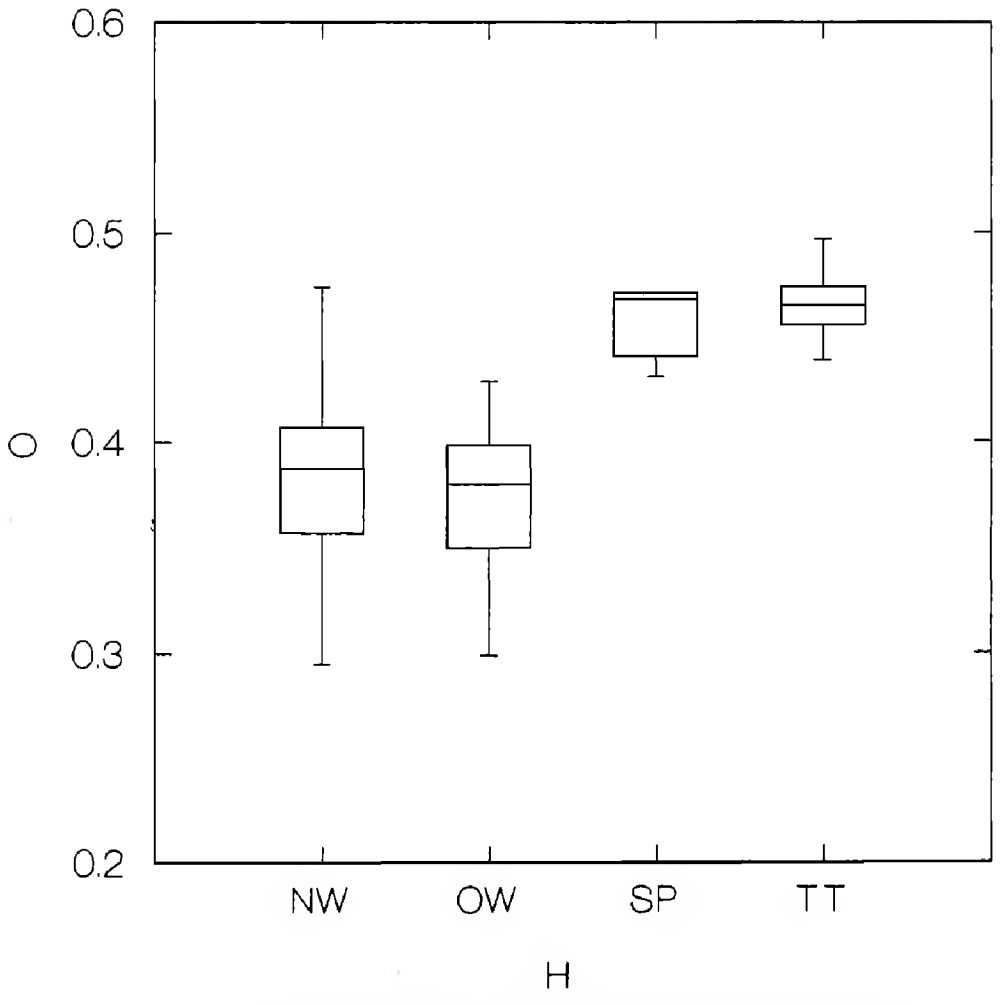

Figure 3. Maximum width and width at orbit of pied woodpeckers and sapsuckers. NW, New World four-toed species; OW, Old World four-toed species; SP, sapsuckers; TT, three-toed species.

(1982) descriptions of the head displays of the Ladder-backed Woodpecker (*P. scalaris*), the only New World four-toed species with red on most of the crown in males, seem more similar to those of the closely related (Short 1971a) Downy Woodpecker than to those of the three-toed species. Although this difference may be unrelated to head pattern and or color, paired three-toed woodpeckers are more antagonistic to each other than are New World four-toed species (Kilham 1966, Short 1982).

Genetic studies by Weibel and Moore (2002a, b) did not include nine species of Old World four-toed pied woodpeckers addressed in my study and included fewer species of *Dendropicos* and *Sphyrapicus*. However, my study did not include the Checkered Woodpecker because specimens were unavailable, and I did not compare the neotropical genus *Veniliornis*, which Weibel and Moore (2002a) considered, with *Dendropicos*, to be close to or nested within *Picoides*. Phylogenetic trees generated from sequences of three genes (Weibel and Moore 2002a, b) suggest relationships among the pied woodpeckers but these do not include all taxa and are not yet conclusive. Weibel and Moore (2002b) concluded that there are three New World groups of *Picoides*: the large species, including the White-headed, Hairy, Strickland's (*P. stricklandi*) and Red-cockaded (*P. borealis*), the small

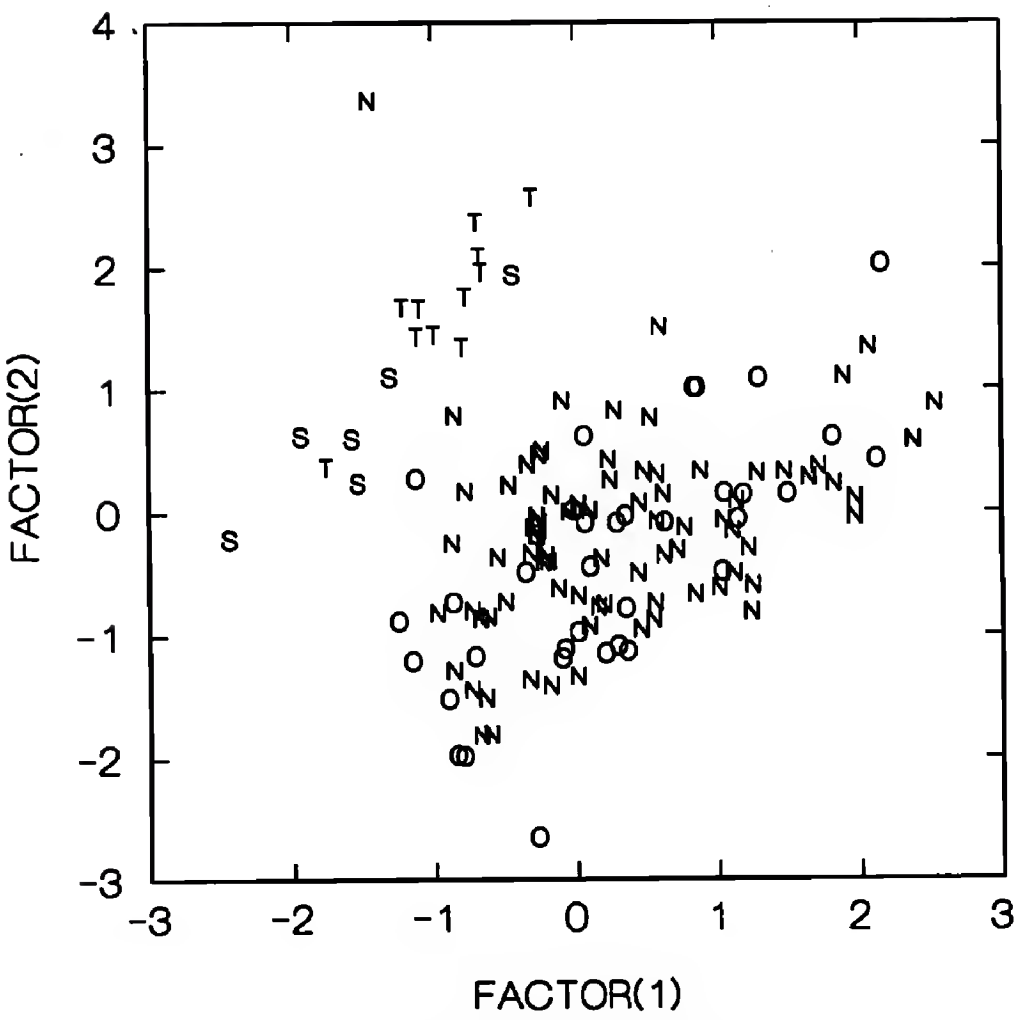

Figure 4. Principal-components analysis of skull measurements of pied woodpeckers and sapsuckers. O, Old World four-toed species; N, New World four-toed species; T, three-toed species; S, sapsuckers.

species, including Nuttall's (*P. nuttallii*), Ladder-backed, and Downy, along with the Lesser Spotted Woodpecker from the Old World), and a neotropical group, including the Striped (*P. lignarius*), Checkered, and the genus *Veniliornis*). Weibel and Moore (2002b) considered *Dendropicos*, with the White-backed (*Dendrocopos leucotos*) and Great Spotted (*D. major*) Woodpeckers, to be "clearly closely related to the New World group," but did not state which group, and that the three-toed and remaining four-toed pied woodpeckers are another distinct group.

CONCLUSIONS AND TAXONOMIC RECOMMENDATIONS

Contrary to Short (e. g., 1974b, 1982), morphological characters of skeletons, regardless of function, serve to identify species groups in woodpeckers (see Olson 1972). Anatomical characters (Spring 1965, Kirby 1980) are also related to behavior (contra Short 1982). The number of toes between groups of pied woodpeckers has long been considered unimportant generically (e.g., Delacour 1951, Short 1971a). However, that character is among many that distinguish the three- and four-toed pied woodpeckers

(Table 2, Figure 3). Furthermore, comparisons of measurements of the skulls of pied woodpeckers reveal that the three-toed woodpeckers differ (Figures 3 and 4) and may be easily identified visually (Figure 2).

Hypotheses (Mengel 1970, Bock and Bock 1974, Short 1971a, Ouellet 1977) speculating on the origin and evolution of pied woodpeckers have emphasized the origin of the three-toed species in North America. Three-toed and four-toed woodpeckers differ from one another more than was generalized by Short (1982), and it is reasonable to believe that three-toed and New World four-toed woodpeckers could have evolved independently. Weibel and Moore (2002a) inferred there were three invasions of Eurasian species.

Although Old World and New World four-toed woodpeckers are similar anatomically (Table 2, Figures 3 and 4), the two groups differ externally and behaviorally (see Ouellet 1977 and others) and karyotypically (Shields 1982, who compared only the Downy, Hairy, Great Spotted, and Lesser Spotted Woodpeckers). My data show multiple generic-level morphological differences between three-toed and New World four-toed woodpeckers, suggesting that they are inappropriately considered congeneric. These differences are more pronounced than those between the New World and Old World four-toed woodpeckers (presently considered to represent different genera), but Ouellet (1977), followed by and substantiated by others (e.g., see Cramp 1985), presented compelling evidence for separation of these two four-toed groups. The three-toed species differ from the New World and Old World four-toed species anatomically, in plumage color of the head, and in some behaviors. Although three-toed and many four-toed Old World pied woodpeckers are similar in three genes (Weibel and Moore 2002a, 2002b), the two groups differ anatomically and behaviorally Ouellet 1977; this study). Four-toed pied woodpeckers from the New and Old Worlds are similar in the anatomical characters addressed in this study but differ genetically (Weibel and Moore 2002a, 2002b), thus supporting Ouellet (1977).

Determining whether the genetic groups (Weibel and Moore 2002b:255) represent distinct genera requires increasing the number of taxa and genes compared, not to mention setting generic limits on genetic data. Further genetic and morphologic studies should help define the pied woodpeckers generically. From this study I conclude that the pied woodpeckers represent three good genera and recommend that the generic name *Dendrocopos* continue to apply to the Old World four-toed species of pied woodpeckers. I also recommend that *Picoides* apply only to the three-toed pied woodpeckers and that the generic name *Dryobates* (type species *pubescens*) be used for the North American four-toed species, the Ladder-backed, Nuttall's, Downy, Hairy, Strickland's, Arizona (*arizonae*), Red-cockaded, White-headed, and provisionally for the South American species, the Striped and Checkered (*lignarius* and *mixtus*).

ACKNOWLEDGMENTS

For loaning specimens, I thank the staffs of the British Museum (Natural History), Louisiana State University Museum of Natural Science, Museum of Vertebrate Zoology, Peabody Museum of Natural History, Royal Ontario Museum, Thomas Burke Memorial Washington State Museum, University of Kansas Museum of Natural

History, University of Michigan Museum of Zoology, and National Museum of Natural History, where the specimens were compared. The illustration of the skulls (Figure 2; specimens in the San Diego Natural History Museum, SDNHM) by Jennifer V. Zee is much appreciated. I also thank R. C. Banks, C. Dove, the late B. L. Monroe, Jr., S. L. Olson, and the late H. Ouellet for commenting on an early draft of the manuscript, and I especially thank R. W. Dickerman, K. L. Garrett, K. Winker, D. D. Gibson, and P. Unitt for their many useful suggestions on a later version.

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Accepted 1 May 2003

NOTES

EVIDENCE FOR NORTHERN WATERTHRUSHES BREEDING IN SOUTHEAST WYOMING

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The Northern Waterthrush (*Seiurus noveboracensis*) is an uncommon but regular visitor to Wyoming during migration and has been documented across much of the state (Dorn and Dorn 1999, Luce et al. 1999). It is suspected to breed at least occasionally in Teton County in northwestern Wyoming (Dorn and Dorn 1999, Luce et al. 1999). In southeastern Wyoming, 20 miles west of the city of Laramie along the Little Laramie River, 11 individuals were captured during three seasons of bird banding for a MAPS (Monitoring Avian Productivity and Survivorship) study. During the summers of 2000, 2001, and 2002 six individuals were recaptured within the same year and three were recaptured in more than one year. Four males and three females were in breeding condition. For three months in 2002 at least two waterthrushes established territories along a small portion of the river, as evidenced by singing males observed each day of MAPS operation. If territories were established during the 2000 and 2001 seasons they remained undetected.

The Northern Waterthrush is known to breed from Virginia north through the northeastern United States, west across much of Canada and Alaska, and south through the Rocky Mountains of Idaho and western Montana (Eaton 1995, American Ornithologists' Union 1998). Disjunct populations are known from northern North Dakota, southern Manitoba, and Saskatchewan. These outposts lie relatively close to the species' core range farther north, but another outlying population, in south-central Oregon, is approximately 400 miles from the main breeding range in the northern Rocky Mountains (Eaton 1995). Northern Waterthrush breeding has been recently documented twice along the Michigan River in north-central Colorado and is suspected more widely in the area (Kingery 1998). These observations were approximately 45 miles south of capture locations along the Little Laramie River in Wyoming and 350 miles southeast of the known southern limit of distribution in the Rocky Mountains (Figure 1).

Although Wyoming was not mentioned specifically by the AOU (1998) or Eaton (1995), the Northern Waterthrush is a rare summer resident in the northwestern part of the state and an uncommon migrant throughout (Dorn and Dorn 1999, Luce et al. 1999). Most Wyoming observations have been presumed to represent migrants, a presumption that may need to be reconsidered in light of recent evidence of breeding in the southeast.

During three seasons of MAPS banding, I captured five males, two females, one juvenile, and three individuals of unknown sex and age between 3 June and 6 August (Table 1). Each year's banding schedule consisted of a total of seven days each separated by at least one week. Sex was determined by the presence of a cloacal protuberance or brood patch, age by plumage or molt. Three individuals were captured over two consecutive seasons, and six were captured twice during a single season. It was unclear if the juvenile was fledged locally or captured during migration, but the same individual was recaptured the following year. Although external sexual characters can persist after breeding, the presence of these characters in combination with consistent recaptures, the capture of a juvenile, and the detection of at least two territories along 700 m of the stream are strong evidence for local breeding.

This finding raises two related questions. First, were Northern Waterthrushes

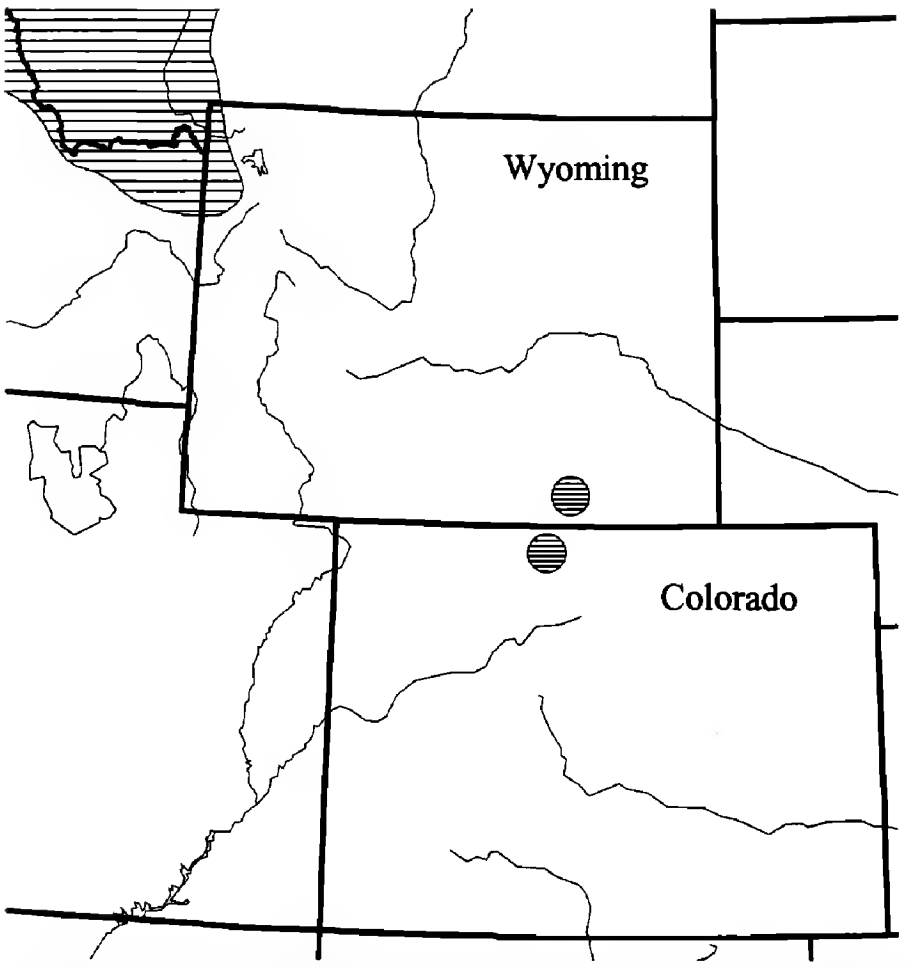

Figure 1. Currently recognized summer distribution of the Northern Waterthrush in northwestern Wyoming and suspected breeding populations in southeastern Wyoming and north-central Colorado.

breeding undetected along the Little Laramie River in the past or are they expanding their range? There is evidence that the range of the Northern Waterthrush is expanding in the Cascade Range of Washington and Oregon (Gilligan et al. 1994). Waterthrushes may be expanding their range in the southern Rocky Mountains of Wyoming and Colorado as well, but it is more likely that breeding populations have been overlooked in the past. Although males can be conspicuous while singing, in the West, waterthrushes select for breeding dense tangles of willow and alder along watercourses (Eaton 1995). Not only are these habitats difficult to navigate, most of the lower-elevation streamside habitat in the region is privately owned and difficult to reach, and therefore not adequately surveyed.

Second, are waterthrushes breeding elsewhere in Wyoming and Colorado or are these isolated populations? Riparian habitat along the Little Laramie River is dominated by narrowleaf cottonwood (*Populus angustifolia*), tangles of willow (*Salix bebbiana, S. monticola, S. exigua*) and shrubs such as Say's rose (*Rosa sayi*). Similar habitat can be found scattered through the foothills of most mountain ranges in Wyoming and Colorado, hence small breeding populations may exist elsewhere in these states.

Most published range maps display the southern limit for breeding distribution of Northern Waterthrush in the Rocky Mountains as extreme northwestern Wyoming. Although waterthrushes regularly pass through Wyoming and Colorado during migration, there is increasing evidence of multiple breeding populations further south. Distribution maps should reflect the waterthrush's status as a rare breeding species in

Table 1 Sex, Sex Character, and Date of Capture of Northern Waterthrushes near Laramie, Wyoming

Bird	Sex	Sex Character[a]	Date Captured
1	M	CP	17 Jun 2000
		None	6 Aug 2000
2	M	CP	9 Jul 2000
3	?	None/Juv	16 Jul 2000
		None	1 Jul 2001
4	M	CP	4 Jun 2000
		CP	17 Jun 2000
		CP	10 Jun 2001
		CP	1 Jul 2001
5	?	None	5 Aug 2001
6	F	None	3 Jun 2001
		BP	1 Jul 2001
		BP	16 Jul 2002
7	?	None	29 Jul 2002
8	?	None	17 Jun 2002
		None	24 Jun 2002
9	M?	CP small	16 Jul 2002
10	M	None	9 Jun 2002
		CP	24 Jun 2002
11	F	BP	9 Jun 2002
		BP	8 Jul 2002

[a]CP, cloacal protuberance; BP, brood patch.

the region, and field biologists should document occurrences and habitat use in the southern Rocky Mountains carefully.

I thank Stan Anderson, Gary Beauvais, Andrea Cerovski, Robert Dorn, Stephen W. Eaton, Doug Faulkner, Doug Keinath, Marni Koopman, and Paul E. Lehman for their assistance and comments.

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Accepted 16 April 2003

THE WESTERN BLUEBIRD AS HOST FOR THE BROWN-HEADED COWBIRD: A NEW RECORD FROM CALIFORNIA

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Nest records for North America suggest that brood parasitism by Brown-headed Cowbirds (*Molothrus ater*) on cavity-nesting species is relatively rare. Indeed, a summary by Friedmann and Kiff (1985) indicated that cavity nesters constitute only 8% of known hosts of the cowbird. Of these, only the Prothonotary Warbler (*Protonotaria citrea*) was considered to be a major host.

In bluebirds (*Sialia* spp.), all cavity nesters, documented incidences of cowbird parasitism are extremely rare (Gowaty and Plissner 1998). Most involve the Eastern Bluebird (*S. sialis*). Power and Lombardo (1996) reported only four cases of cowbird parasitism of the Mountain Bluebird (*S. currucoides*), with no accounts of cowbirds raised to fledging. Campbell et al. (1997) found that only two of 767 Western Bluebird (*Sialia mexicana*) nests in British Columbia contained cowbird eggs, and neither produced fledgling cowbirds. Bendire (1893) and Friedmann and Kiff (1985) alluded to occasional cowbird parasitism of the Western Bluebird but did not indicate that the Western Bluebird ever fledged cowbirds. Recently, however, I discovered three cases of parasitism of the Western Bluebird, one of which resulted in a cowbird fledging and associated bluebird mortality.

The observations occurred within the context of a study of artificial nest boxes conducted along lower Putah Creek, Yolo and Solano counties, in California's Sacramento Valley. This fragmented riparian habitat, surrounded by agricultural and grazing lands, is frequently invaded by cowbirds during the breeding season (Gaines 1980).

On 2 June 2001, I discovered a cowbird egg with three Western Bluebird eggs in an artificial nest box (labeled E3.4). The pair of bluebirds had already fledged five chicks from a nearby nest box (E3.0). The parasitized nest was in a standard North American Bluebird Society side-opening box with dimensions of 26 × 15 × 15 cm, with an entrance hole 4 cm in diameter. This box had been retrofitted to hang from a tree branch via a wire hook (Purvis 2000) and was hung at a height of approximately 3 m above the ground, facing southeast, in a mature Interior Live Oak (*Quercus wislizenii*) tree located in a 1-hectare fragment of oak savanna adjacent to the riparian corridor.

On 11 June, I discovered that the female bluebird had laid another egg in her clutch—suggesting that she had not been deterred by the presence of the cowbird egg—and had begun incubation. The male bluebird remained nearby, tending to the juveniles from the first brood. None of the eggs in the parasitized clutch hatched—despited being incubated to term—and so were deposited with the nest in the Museum of Wildlife and Fisheries Biology, University of California, Davis (museum number WFB-4968). The same pair of bluebirds then initiated a third clutch in another nearby nest box (E3.7). This clutch also failed to hatch. There was no embryonic development in any of the eggs from either clutch.

In 2002, after again successfully fledging a first clutch from box E3.0, the female bluebird again laid a second clutch in E3.4 that was again parasitized by a cowbird. Since cowbirds typically have strong site fidelity (Dorst 1971, Lowther 1993), it is possible that the nest was parasitized by the same cowbird as in the previous year. I do not know whether the cowbird removed any host eggs at the time of parasitism, a common practice among cowbirds (Lowther 1993), but one bluebird egg did disappear *after* incubation had begun, resulting in a clutch of two bluebird eggs and one

cowbird egg. This time, two of the eggs hatched: the cowbird egg on or about 16 June, and one of the bluebird eggs on or about 17 June. The other bluebird egg failed to hatch and contained no embryonic development.

The cowbird was about one-third larger than the bluebird chick at hatching and quickly outpaced it in growth and development. On 26 June, the cowbird fledged while the bluebird remained behind in the nest box. Its eyes had still not opened—though bluebirds' eyes typically open at around seven to eight days of age (Guinan et al. 2000)—and it weighed only 18.0 grams, compared to an average weight of 22.4 grams for bluebird nestlings of comparable age from the same location (unpubl. data).

Once fledged, the cowbird received the majority of the host pair's attention. In a timed observational study of parental provisioning, the cowbird fledgling was fed five times in 22 minutes while the bluebird nestling was fed only once. This observational period was cut short by attempted predation of the cowbird by a Western Scrub Jay (*Aphelocoma californica*). The jay and a companion (probably its mate) were driven off by the mobbing bluebird pair, which then remained with the grounded cowbird fledgling, neither making any attempt to visit the nestling bluebird.

Two days later, the fledgling cowbird had disappeared and the nestling bluebird was dead. I observed the male bluebird looking into the box containing the dead nestling on one occasion. As in the previous year, the bluebirds initiated a third clutch in box E3.7. This clutch was also parasitized with a cowbird egg but was abandoned when the eggs failed to hatch. No embryonic development was detected in any of the eggs.

Of all North American bird species, few have experienced a greater expansion in distribution than has the Brown-headed Cowbird (Campbell et al. 2001). Furthermore, there is evidence that cowbirds colonizing parts of western North America parasitized many species that had little recent experience with them (Friedman and Kiff 1985). Indeed, since the 1920s, the number of species that have been known to serve as hosts for Brown-headed Cowbirds has increased from 157 to over 220 (Campbell et al. 2001).

Brown-headed Cowbirds have been very successful in colonizing California's Central Valley, most likely because of conversion of native landscapes to agriculture (Laymon 1987). As their populations increase, cowbirds may continue to expand their suite of preferred hosts to include formerly underexploited species such as the Western Bluebird.

My sincere thanks to Judith A. Guinan, who located published accounts of brood parasitism in Western Bluebirds, and to Andrew Engilis, Jr., John M. Eadie, and Alex Cruz for technical support and helpful review of the manuscript. I acknowledge especially the excellent work of my field assistants Michael T. Atamian, Andrew R. Grant, Ian T. Taylor, and Jonathan H. Widdicombe.

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Accepted 8 May 2003

Western Field Ornithologists' Field Trip Birding San Blas, Mexico, January 17–24, 2004

San Blas is a premiere birding spot on Mexico's west coast. It became famous in the 1960s and '70s following the publication of Peter Alden's guide and a Christmas bird count that flirted regularly with the 300-species mark. It remains a prime destination for birders because of the town's charm as a small fishing village combined with its proximity to habitats ranging from ocean to mangrove swamp, dry tropical forest, dry scrub, tropical deciduous forest, and pine–oak forest in the nearby mountains. This range of habitats supports many endemic species such as the Rufous-bellied Chachalaca, Elegant Quail, Mexican Parrotlet, Eared Poorwill, Golden-crowned Emerald, Mexican Woodnymph, Bumblebee Hummingbird, Citreoline Trogon, Golden-cheeked Woodpecker, White-striped Woodcreeper, Black-throated Magpie Jay, San Blas Jay, Purplish-backed Jay, Sinaloa Crow, Spotted Wren, Sinaloa Wren, Happy Wren, Red Warbler, Red-headed Tanager, Rusty-crowned Ground-Sparrow. Another specialty group are mangrove species such as the Boat-billed Heron, Snail Kite, Limpkin, Mangrove Cuckoo, Mangrove Vireo, Mangrove Swallow, and Mangrove Warbler.

The group size will be limited to eight. The trip is open to a wide range of bird-watching skill levels, and the pace will be moderate. There will be evening presentations by the leaders and local biologists on the natural history of the area and ornithological research that is taking place in west Mexico. Costs will range from $1550 to $2150 from Puerto Vallarta. For more information, please write to Tom Ryan at wtswift@aol.com. This field trip is open to both members and nonmembers of WFO.

BOOK REVIEW

Monterey Birds, by Don Roberson. Second edition. 2002. Monterey Peninsula Audubon Society, Carmel, California. viii + 536 pp., 16 color plates, 61 black-and-white photos, 182 maps, 2 tables. Paperback, $24.95. ISBN 0-9615798-2-X.

Monterey County—a large coastal county in central California—is famous for its agreeable climate, varied landscape, and a bird list of 482 species: about 78% of California's total and nearly 50% of all species recorded in the United States. It has hosted several first state records (e.g., of the Long-toed Stint) and even some first North American records (e.g., of Stejneger's Petrel). This book is a fully updated and expanded version of Roberson's out-of-print 1985 first edition of *Monterey Birds*, which summarized the status and distribution of this county's ample avifauna. All species are now treated more thoroughly, including 54 that have been recorded in the county since the first edition was published, and the result is a book twice the size of the first edition (536 pages vs. 266 pages). The format is essentially unchanged and follows that of most regional "when and where" bird books, with individual species accounts as its core. There are 35 pages of detailed bird-finding routes, followed by brief chapters on bird-distribution patterns, impacts of El Niño, migration, taxonomy, molt, and conservation. Each species account covers status, distribution, and subspecific taxonomy; a bar graph illustrates seasonal abundance, and a range map is included for species that nest in the county. The book generally follows the taxonomy and nomenclature of the AOU (1998), but for nonpasserines it follows the taxonomy in the *Handbook of the Birds of the World* (del Hoyo et al. 1992-2002), which varies slightly from that of the AOU.

This must be one of the most detailed county bird books yet published, with a tremendous amount of information pertaining to many aspects of bird occurrence. Indeed, a feature that sets this book apart from most regional and even state bird books is its thoroughness. In preparing this book the author examined more than 10,000 museum specimen records from nine museums, 40,000 sight records, and data from the Monterey County Breeding Bird Atlas (Roberson and Tenney 1993), local and regional banding projects, Christmas Bird Counts, Breeding Bird Surveys, and Winter Bird Censuses. He cites 551 specific published and unpublished references extending from 1871 to 2002, including ones from expected journals such as *Condor* and *Western Birds* to *Journal of Molecular Evolution* and *Limnological Oceanography*. A testament to Roberson's thoroughness is the citation of John Steinbeck's 1937 novel, *Of Mice and Men*—a story set in Monterey County—to illustrate the probable presence of introduced Rock Doves early in the 20th century, when no one cared to document the occurrence of nonnative, nongame birds.

Other strong points of the book include its broad and interesting selection of photos and its helpful information on identification and subspecies. Its coverage of subspecies helps us appreciate the complexity of bird distribution and movements: e.g., Hermit Thrushes breeding in Monterey County are not the same ones that winter there. Also, the author's careful review of information insures that a minimum of erroneous information was included.

Records of especially rare birds are usually included only if they were reviewed and accepted by the California Bird Records Committee (hereafter CBRC). But the author admits in the introduction (p. 58) that he included several records that the CBRC did not accept but he considers to be "good" records nonetheless. While we understand the rationale for including such records, we are usually left wondering which records are which: e.g., Roberson includes a record of the Veery at the Carmel River mouth, 21–22 September 1998, that was not accepted by the CBRC—but there is nothing distinguishing it in the text from the one other Veery record, which was accepted. That he includes such records is justifiable, but that he does not flag them undermines the significance of CBRC decisions. This course denies the useful role of the CBRC and

does disservice to the community of observers who submit reports of rare birds.

Roberson often describes historical changes in distribution and abundance of birds, sometimes revealing major landscape changes as the cause. He notes, for example, that Black-crowned Night-Herons once bred more widely before the Salinas River was re-routed and marshes were drained, citing egg sets from the 1890s. He also notes more recent changes, some where the cause is not as evident (e.g., the Western Grebe historically was present along the coast only in the nonbreeding season, but it is now present year round). Such facts are common in this book and are not limited to those involving major population trends. For example, Roberson points out that the breeding success of Brandt's Cormorants on the Coast Guard jetty at the Monterey harbor depends on the patterns of basking California sea lions: when sea lions are present they dominate the jetty and cormorant nests are restricted to a few channel pilings.

Although the book is stuffed with good information, it is highly biased toward the northwestern corner of the county, principally the coastal region from the Pajaro River to Big Sur. While in many respects this is the most interesting part of Monterey County, and the emphasis reflects the distribution of birders, there must be a great deal to be learned about the more remote parts of the county. And, admittedly, several intriguing occurrences are cited from the county's southeast corner. But we get the impression that many more surprises will come to light in the little-visited Gabilan and Santa Lucia mountains and upper Salinas Valley.

Throughout the book, Roberson refers to "our" and "we," but it is not always clear exactly what he means. References to "our" birds nesting in the county—to be general—are fine in the parochial sense, but what do they mean to a reader in New York? Also, the use of "we" in places implies a group opinion or consensus, when instead it seems to be mostly the author's opinion being put forward.

The author regularly describes a bird's status more broadly, into neighboring counties, across the state, and beyond. While this is helpful in highlighting geographic patterns and knowledge gaps, we found instances where such information was misleading or actually erroneous. For example, the Snowy Egret account references "small nesting colonies" in Santa Cruz County, but we are unaware of any breeding records. Although Roberson frequently makes comparisons to Santa Cruz County, he makes relatively little comparison to Santa Clara, San Benito, Fresno, Kings, or San Luis Obispo counties. Does this reflect a lack of information from neighboring parts of those adjacent counties? Or does it largely reflect the heavy emphasis on patterns of occurrence in the northwestern corner of Monterey County? Nonetheless, the comparisons he does make are valuable, and the reader will undoubtedly make others. For example, only riparian nesting of Green Herons is referenced in Monterey County, yet in recent years there have been many records of nesting from urban or suburban "habitats" in Santa Cruz County. Are urban-nesting Green Herons lacking in Monterey County, or are they still to be discovered? For the Brant, Roberson comments that it is "best known from fall migration..." We find that curious, as the Brant is seldom reported in Santa Cruz County in fall but is much more prominent there in spring—Brants must migrate south through Santa Cruz County, but why are they so invisible? This is a puzzling discrepancy for a population that must be passing more or less equally through both counties.

The species accounts contain a number of instances where Santa Cruz County records were adopted as Monterey County records and even graphed (e.g., a 19 March record of the South Polar Skua). These involve mostly rarities or unseasonable occurrences that were very close to Monterey County, and in one case Roberson admits adopting it because the bird must have flown through Monterey County. We understand this, but don't think it is "cricket" in a county bird book (county bird-record keepers can be more territorial than the birds themselves).

There is a heavy emphasis on rarities in this book, and the author admits as much

and makes no apologies for it. But the short treatment given many common species seems to leave out much that might be of interest (e.g., the Crested Caracara with a single record gets two pages, while the American Kestrel with an estimated 750 nesting pairs is covered in a half page). In some cases, this might reflect an actual lack of specific information on the common species, since most observers tend only to report rare occurrences.

Roberson frequently speculates on various aspects of occurrences. We appreciate that he has done this; it makes the accounts lively and unsheathes new questions. These proposals, however, are not always convincing. On occasions the author attempts to link two or more disparate records: e.g., he hypothesizes that a single male Harlequin Duck was responsible for irregular sightings over a 12-year period, even though occasionally two males were present and neither had distinguishing field marks. If this conjecture is true, the bird would set a longevity record for the species (Klimkiewicz 2002). In another instance he claims that the first two reports of a Great-tailed Grackle in Monterey County, coming on the same day, involved the same bird even though they were 18 miles apart. Likewise, he suggests that several Tufted Ducks seen in Monterey County may have been the same individuals seen hundreds of miles south in southern California. Although these interpretations are plausible, we are unconvinced.

Roberson also argues that because turkeys were present in California during the Pleistocene, those introduced by the California Department of Fish and Game could be thought of as reintroduced native birds. This concept is appealing, but none of the Pleistocene turkeys from California has been definitively identified as the Wild Turkey (Steadman 1980), and the species best represented in the fossil record has been thought more closely related to the Ocellated Turkey (*Meleagris ocellata*) of southeastern Mexico and Central America (Stock 1992). In other instances, the author's speculations seem right on target. For example, he attributes an apparent decline in White-winged Scoters to increasing sea-surface temperatures. And this seems likely, given the apparent affects of increasing ocean temperatures on regional numbers of two other shallow-diving seabirds, the Sooty Shearwater and Cassin's Auklet (Oedekoven et al. 2001).

The useful and detailed range maps are based on the five-year breeding bird atlas (Roberson and Tenney 1993). Although the maps are first-rate, we found some oversights, e.g., the map (and text) for Wilson's Warbler misses all the nesting in the lower Salinas Valley and the northern margin of the county, a difference inexplicably at odds with the findings reported in the atlas cited above. Also, the maps for Blue-gray Gnatcatcher and all breeding thrushes were omitted. These and corrections for other map glitches, plus general errata, are on the author's website at http://montereybay.com/creagrus/errata.html.

We also found numerous typos (e.g., a 1997 paper by Unitt and Rea mentioned in the Brown Creeper account is listed as being from 1977, although the correct date is cited elsewhere in this account and in the literature cited), omissions (e.g., there is a third northern California record of the Greater Pewee, in 1984/1985 at Union City, Alameda Co.), apparent miscues (e.g., Roberson says Western Gulls breeding in Monterey County are of the northern subspecies *occidentalis*, but Grinnell and Miller [1944: 166] noted that the breeding range of the southern subspecies *wymani* extends north to Point Lobos, Monterey County, and egg sets collected in Monterey County [e.g., Museum of Vertebrate Zoology specimen 5636] are assigned to this subspecies), and hyperbole (e.g., Roberson claims that "literally millions" of phalaropes were pushed into the bay in late April 1996 and implies that most were Red Phalaropes—del Hoyo et al [1996: 532] listed the world population of Red Phalarope at 100,000 to 1,000,000 birds).

Despite the book's apparent provincialism, its appeal will extend beyond Monterey County's boundaries. Indeed, we referred to the first edition of this book commonly to

make sense of occurrence patterns not only in neighboring Santa Cruz County, but also for perspectives on bird occurrences all along the west coast, and in the West in general. While we have shown what must seem to be more negative points than positive ones, a book with so many details is predisposed to this kind of criticism. It is, however, a wonderful book, admirable for its breadth, its authoritativeness, and its readability. It sets a new standard for county-level status and distribution books, and we recommend it with unbridled enthusiasm.

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Jeff N. Davis and David L. Suddjian

FEATURED PHOTO

A LEUCISTIC WILLET IN CALIFORNIA

CHARLES T. COLLINS, Department of Biological Sciences, California State University, Long Beach, California 90840

For several weeks in June 2002 a largely white-plumaged Willet (*Catoptrophorus semipalmatus*) was observed at the Bolsa Chica Ecological Reserve, Orange County, California. During this time numerous observers saw the bird as it foraged at the reserve and occasionally on the ocean front at the adjacent Bolsa Chica State Beach. Mike Bowles obtained the photographs shown on this issue's back cover, which made possible a closer study of this interesting bird.

Albinism, which involves a complete absence of all pigments from both plumage and soft parts, is decidedly rare in birds (Sage 1963, Gross 1965). More common is an absence of pigments in some or all of the plumage but not the eyes or soft parts, a condition frequently termed "partial albinism" but properly called leucism (Buckley 1982, 1987; Collins 2002). Leucism can vary in extent from only a few scattered white feathers to bilaterally symmetrical patches or completely white birds with only the eyes and soft parts pigmented (Buckley 1982, 1987). An entirely white-plumaged Anna's Hummingbird (*Calypte anna*) with dark eyes and bill (e.g., Childs 1994) gives an example of complete leucism. A recent Featured Photo (Garrett 2001) examined a case of partial leucism in Heermann's Gull (*Larus heermanni*). Leucistic individuals are not frequently encountered, and this appears to be the first photographically documented instance of it in the Western Willet (*C. s. inornatus*). On the other hand, it is surprisingly frequent in the Eastern Willet (*C. s. semipalmatus*), with several seen each year along the Atlantic and Gulf coasts (Mills 1970; P. Buckley pers. comm.). The reasons for this interpopulational difference are not understood. However, each individual offers an opportunity to learn more about the pigment systems present in birds and the functional significance of their color patterns.

When walking or standing, the leucistic Willet at Bolsa Chica appeared largely white with a dark eye and dark distal half of the bill. The raised wings, however, showed extensive dark pigmentation of the underwing coverts, axillars, and flight feathers. This suggests a loss of phaeomelanin in the body with retention of darker eumelanin in the wings and axillars. If true, this should be more correctly considered a case of melanic–melanic schizochroism rather than incomplete leucism. The dorsal side of the older, unmolted secondaries and outer primaries showed substantial bleaching compared with the newly molted innermost four primaries. The unpigmented tips of the outer primaries also showed extensive wear and erosion of the vane, leaving nearly bare terminal shafts. The deposition of harder and granular melanin pigments in the tips of outer primaries has been suggested to be a mechanism to prevent the type of excessive wear noted here (Burtt 1979).

Albinistic and leucistic birds lacking much of the normal protective coloration are generally not thought to live long in the wild. Bolsa Chica's leucistic Willet was at least one year old, as indicated by the start of a complete prebasic molt (the first prebasic molt in Willets is incomplete; Lowther et al. 2001). The fact that this bird was well southwest of the largely inland breeding range of the western population of the Willet during the breeding season suggests that it was a younger, prebreeding individual, perhaps one or two years old. The age of first breeding of western Willets appears to be three years (Lowther et al. 2001).

Since this Willet's legs were pale yellow, rather than the normal gray or greenish gray with darker melanins obscuring the yellow carotenoid pigments occurring with them, the legs showed melano–carotenoid schizochroism (Buckley 1982, 1985; Collins 2002).

I am indebted to Paul Buckley for helpful comments on the manuscript and to Mike Bowles for the use of his outstanding series of photographs of Bolsa Chica's white Willet and permission to include two of them here.

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WESTERN BIRDS

World Wide Web site: www.wfo-cbrc.org

Quarterly Journal of Western Field Ornithologists

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Published September 15, 2003 ISSN 0045-3897

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WESTERN BIRDS

Vol. 34, No. 3, 2003

Western Specialty:
Hermit Warbler

Photo by © Dave Furseth of Murrieta, California: Hermit Warbler (*Dendroica occidentalis*) San Diego, California, May 2001.

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Front cover photo by © Bill Hill of Carmel, California: Crested Caracara (*Caracara cheriway*), Marina, California, 11 August 2002. The recent extralimital sightings of this species have led to re-examination of the question of natural vagrancy vs. escape from captivity.

Back cover "Featured Photo" © by Peter Gaede of Carpinteria, California: Flammulated Owl (*Otus flammeolus*), Sublett Mountains, Cassia County, Idaho, July 1992.

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Good photographs of rare and unusual birds, unaccompanied by an article but with caption including species, date, locality and other pertinent information, are wanted for publication in Western Birds. Submit photos and captions to Photo Editor. Also needed are black and white pen and ink drawings of western birds. Please send these, with captions, to Graphics Manager.

WESTERN BIRDS

Volume 34, Number 3, 2003

REPORT OF THE ALASKA CHECKLIST COMMITTEE, 1997–2002

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ABSTRACT: During the six years 1997–2002 there were 21 additions to the Alaska list, four other status changes based on taxonomic decisions, and one deletion, resulting in a net total of 468 species and 110 additional subspecies of birds known at the beginning of 2003 to have occurred naturally in Alaska.

Using the published inventory of Alaska birds (Gibson and Kessel 1997) as a foundation, we have assembled here all additions to, systematic status changes to, and deletions from the Alaska list during the years 1997–2002, inclusive. The 1997 inventory discussed 448 species and 110 additional subspecies. At the beginning of 2003, with the additions, status changes, and deletions published here, the Alaska list included 468 species and 110 additional subspecies. Occurrence of most of these 578 taxa in Alaska is substantiated by archived voucher specimens, but some are substantiated by archived photos or sound recordings only. For all taxa here added to the Alaska list we include all records and published reports through 2002. For those formerly included on the unsubstantiated list we include reference to the reports on which that status was based. No avian species or subspecies is added to the Alaska list in the absence of an archived voucher specimen, photo, videotape, or sound recording. Additions to the unsubstantiated list are founded on compelling written details (on file at the University of Alaska Museum) from at least one experienced observer. All involve accepted identifications. Subspecies bracketed below are inferred, not based on identified specimens.

Recognizing the impressive movements of Alaska's avifauna—many species and subspecies perform extraordinary annual intercontinental migrations to reach Alaska—we strive to keep segregated taxa of proved identity whose occurrence here is the result of proximate human assistance only, known or presumed. These include captive birds deliberately released (e.g., various upland game-birds by the Alaska Department of Fish and

Game), escapes from captivity, and ship-assisted arrivals. We currently maintain Alaska files on over a dozen such species, including the Humboldt Penguin (*Spheniscus humboldti*), Brown Pelican (*Pelecanus occidentalis*), Brown Booby (*Sula leucogaster*), Red-footed Booby (*Sula sula*), American Flamingo (*Phoenicopterus ruber*), Red-breasted Goose (*Branta ruficollis*), Mandarin Duck (*Aix galericulata*), Chukar (*Alectoris chukar*), Kalij Pheasant (*Lophura leucomelanos*), Brown Eared Pheasant (*Crossoptilon mantchuricum*), Cheer Pheasant (*Catreus wallichi*), Reeves's Pheasant (*Syrmaticus reevesii*), Ring-necked Pheasant (*Phasianus colchicus*), Northern Bobwhite (*Colinus virginianus*), Rock Pigeon (*Columba livia*), Common Bronzewing (*Phaps chalcoptera*), and White-vented Myna (*Acridotheres javanicus*).

The following accounts include 21 additions to the Alaska list, four changes for taxonomic reasons, and one deletion. Citations to the publication *American Birds/North American Birds/Field Notes* are abbreviated AB, NAB, or FN, respectively. Some recent documentary photos have also been published in *Birding World* (BW). UAM abbreviates University of Alaska Museum. The listing of each taxon's type locality in braces parallels Gibson and Kessel (1997).

ADDITIONS TO THE ALASKA LIST

Podiceps nigricollis [*californicus* Heermann, 1855 {type locality: California}]. Eared Grebe. One well substantiated record (no specimen; photos at UAM): one with Horned Grebes, 21–26 May 1998, Fairbanks, D. C. Weisensel et al. (FN 52:372). Subsequent report of one, Juneau, 20–21 May 2000, R. J. Gordon et al. (NAB 54:316). In the New World the species breeds as close to Alaska as southern Yukon Territory and northeastern and central-interior British Columbia (AOU 1998).

Puffinus creatopus Coues, 1864 {type locality: San Nicolas Island, California}. Pink-footed Shearwater. First substantiated record (photos at UAM): one, 13 August 2000, Gulf of Alaska off Kodiak Island at Albatross Banks (56° 36′ N, 152° 43′ W), D. W. Sonneborn. First Alaska specimen obtained one year later: UAM 13567, male, 3 August 2001, Gulf of Alaska off Cape Fairweather (at 58° 24′ N, 138° 56′ W), D. W. Sonneborn. Breeds on islands off Chile and ranges at sea off the Pacific coast of the Americas (see AOU 1998).

The species was first reported in Alaska on 24 August 1917 off Forrester Island (Willett 1918) and, in view of subsequent reports (e.g., see Isleib and Kessel 1973), was formerly regarded as a "rare summer visitant on the North Pacific Ocean in south-coastal and southeastern Alaska" (Kessel and Gibson 1978), but until 2000 it was unsubstantiated.

Puffinus gravis (O'Reilly, 1818) {type locality: latitude of Cape Farewell and Staten Hook, frequently Newfoundland in summer}. Greater Shearwater. One record (no specimen; photo published and at UAM): one, 3 August 2001, Gulf of Alaska off Montague Island (at 59° 50′ N, 148° 00′ W), J. M. Pearce (Pearce 2002). The species breeds in the South Atlantic Ocean and ranges widely throughout the Atlantic (AOU 1998); the only other North Pacific records are from California (once in fall and at least once in winter, Garrett and Wilson 2003). Remarkably, Alaska's first specimen of *P. creatopus* and Alaska's first record of *P. gravis* were obtained the same day.

Puffinus bulleri Salvin, 1888 {type locality: New Zealand}. Buller's Shearwater. First substantiated record (no specimen; photos at UAM, Figure 1): one, 6 September 1997, Gulf of Alaska off Sitka (at 57° 06′ N, 136° 25′ W), D. W. Sonneborn and P.

Figure 1. Buller's Shearwater off Sitka, Alaska, 6 September 1997.

Photo by D. W. Sonneborn

M. Suchanek. There were additional records, of up to 20 birds, in September and October 1997 off Middleton Island (FN 52:108). The species breeds on islands off New Zealand and ranges at sea in the Pacific Ocean off the west coast of North America from the Gulf of Alaska to Baja California (AOU 1998). Both *P. bulleri* and *P. creatopus* are seasonally fairly common or common along the outer coast of British Columbia (Campbell et al. 1990) and probably occur regularly in Alaska waters in the Gulf of Alaska (e.g., see Isleib and Kessel 1973), but their status is poorly known.

Egretta garzetta garzetta (Linnaeus, 1766) [type locality: "Oriente" = northeastern Italy]. Little Egret. One record (specimen UAM 11000): ad. male, found dead 27 May 2000, Buldir Island, Aleutian Islands, M. Renner and I. L. Jones. Identification to subspecies by D. D. Gibson, at UAM. The species breeds widely and locally in the tropical and temperate zones of the Old World from southern Europe and Africa to the Philippines, Sunda Archipelago, and Australia. In Asia the Little Egret ranges north and east to Japan (see Vaurie 1965), where a common breeder on Honshu and an irregular visitor as far north as Hokkaido (OSJ 2000).

Pluvialis apricaria (Linnaeus, 1758) [type locality: Lapland]. European Golden-Plover. First substantiated record (specimen UAM 12100): first-winter male, 13–14 January 2001, Ketchikan (Gravina Island), A. W. Piston and S. C. Heinl (Piston and Heinl 2001). This was also the first record in the Pacific basin and the first winter record for North America. The species breeds in northern Eurasia east to the Taimyr Peninsula (AOU 1998); it winters primarily in the British Isles, western Europe, and North Africa (Vaurie 1965). It was previously on the unsubstantiated list on the basis of one seen 13 June 1980 at Point Barrow (B. J. McCaffery).

Larus minutus Pallas, 1776 [type locality: Berezova, Tobolsk, Siberia]. Little Gull. First substantiated record (no specimen; published photo, additional photos at UAM): adult in summer plumage, 28 April–13 May 2001, Ketchikan, S. C. Heinl, A. W. Piston, et al. (NAB 55:340). Subsequent reports include an adult in summer plumage,

23–24 May 2001, Juneau, P. M. Suchanek et al. (NAB 55:340), a one-year-old, 28 May 2002, Juneau, P. M. Suchanek et al. (NAB 56:345), and another one-year-old, 26–29 June 2002, Anchorage, A. Jaramillo et al. (NAB 56:472). The species is a casual visitant on the Pacific coast of North America from southern British Columbia to southern California (AOU 1998).

The Little Gull was previously on the unsubstantiated list on the basis of one, 9 September 1975, Cordova area (M. E. Isleib), an adult in winter plumage, 4 October 1992, Snow Passage, Clarence Strait (S. C. Heinl, AB 47:134), an adult in winter plumage, 8 August 1994, Chichagof Island (K. Bardon, FN 49:85), and a one-year-old, 5 May 1995, Kodiak Island (R. A. MacIntosh).

Sterna fuscata (*nubilosa* Sparrman, 1788) [type locality: "India orientalis" (Peters 1934)]. Sooty Tern. One record (specimen UAM 7280): headless skeleton with some attached and some associated remiges, found in September 1997, Attu Island, Aleutian Islands, R. W. Dickerman (Dickerman et al. 1998). The species breeds widely on tropical islands in the Pacific Ocean (see AOU 1998) and is casual or accidental as far north as California (see Garrett and Wilson 2003) and Hokkaido (OSJ 2000).

Empidonax traillii adastus Oberholser, 1932 [type locality: Hart Mountain, Oregon]. Willow Flycatcher. Additional subspecies. One record (specimen UAM 5528): singing male, 16–24 July 1988, west slope of Chugach State Park at elevation 700 m, Anchorage area, M. E. Isleib and T. G. Tobish, Jr. Identification to subspecies by P. Unitt, at San Diego Natural History Museum (cf. Gibson and Kessel 1997). The subspecies breeds "from southeastern British Columbia to eastern California, and the Great Basin to the Rockies north of extreme southern Utah" (Browning 1993).

Sayornis nigricans Vigors, 1839 [type locality: Monterey, California]. Black Phoebe. One record (no specimen; photos at UAM): one netted, banded, photographed, and released, 4 July 2000, Denali National Park (at 63° 25′N, 150° 26′W), C. Kelly fide D. F. DeSante (NAB 54:413). The species breeds north to southwestern Oregon and ranges casually north to southwestern British Columbia (AOU 1998).

Sylvia curruca (Linnaeus, 1758) [type locality: Sweden]. Lesser Whitethroat. One record (no specimen; photo published, videotape at UAM): one, 8–9 September 2002, Gambell, St. Lawrence Island, P. E. Lehman (Lehman 2003; photo published both there and in BW 15:432, 2002). The Lesser Whitethroat breeds in Eurasia from western and central Europe east to Yakutia and Transbaikalia in the vicinity of 130° E (see Vaurie 1959, Cramp 1992).

Phylloscopus trochilus (Linnaeus, 1758) [type locality: England]. Willow Warbler. One record (no specimen; photo published, videotape at UAM): one, 25–30 August 2002, Gambell, St. Lawrence Island, P. E. Lehman et al. (Lehman 2003, photo published both there and in BW 15:432, 2002). The species breeds in Eurasia from western and central Europe to eastern Siberia in Anadyrland (see Vaurie 1959, Cramp 1992).

Phylloscopus inornatus [*inornatus* (Blyth, 1842) [type locality: near Calcutta]]. Yellow-browed Warbler. First record (no specimen; photos published and at UAM): one, 23–24 September 1999, Gambell, St. Lawrence Island, P. E. Lehman (Lehman 2000). Subsequent record of one (photo published; videotape and photos at UAM), 30 August 2002, Gambell, St. Lawrence Island, G. L. Armistead and P. E. Lehman (NAB 57:104). The species breeds in Asia from the Ural Mountains through Siberia to the Sea of Okhotsk and Anadyrland (see Vaurie 1959, Cramp 1992).

Muscicapa striata (Pallas, 1764) [type locality: Holland]. Spotted Flycatcher. One record (no specimen; photo published, videotape at UAM): one, 14 September 2002, Gambell, St. Lawrence Island, P. E. Lehman and D. W. Sonneborn (Lehman 2003; photo published both there and in BW 15:432, 2002). The species breeds in Eurasia

from western Europe to Transbaikalia in the vicinity of 120° E (see Vaurie 1959, Cramp and Perrins 1993).

Dumetella carolinensis (Linnaeus, 1766) [type locality: Virginia]. Gray Catbird. First two records (no specimen; photos of each at UAM): one, 10 July to about 24 July 1997, Farm Island, Stikine River, E. Benitz and M. Benitz; one netted, banded, photographed, and released, 5 October 1997, Cape Peirce, J. R. Moran and C. A. Wilson (Figure 2). Subsequent report of one, 13 October 1999, Anchorage, D. F. DeLap et al. (NAB 54:91). The Gray Catbird breeds as close to Alaska as southern interior British Columbia (Campbell et al. 1997).

Dendroica pensylvanica (Linnaeus, 1766) [type locality: Philadelphia, Pennsylvania]. Chestnut-sided Warbler. First substantiated record (specimen UAM 7051): singing male, 22 June 1997, Ketchikan (Pennock Island), S. C. Heinl. The species breeds locally in northeastern British Columbia and is a casual or rare migrant in southern British Columbia and the contiguous western United States (see AOU 1998). The Chestnut-sided Warbler was previously on the unsubstantiated list on the basis of an immature seen 21 September 1981, Middleton Island, Gulf of Alaska, T. G. Tobish, Jr. (AB 36:208).

Dendroica caerulescens (Gmelin, 1789) [type locality: Hispaniola]. Black-throated Blue Warbler. One record (no specimen; photo published, additional photos at UAM): male, 22 November–5 December 2001, Juneau (Tee Harbor), R. A. Wood et al. (NAB 56:91–92). The species breeds no closer to Alaska than eastern Saskatchewan; it is a casual or rare migrant in western North America from British Columbia to Baja California (see AOU 1998).

Figure 2. Gray Catbird at Cape Peirce, Alaska, 5 October 1997.

Photo by Carol Wilson

Emberiza elegans [*elegans* Temminck, 1835 [type locality: Japan]]. Yellow-throated Bunting. One record (no specimen; photos published and at UAM): adult male, 25 May 1998, Attu Island, Aleutian Islands, P. W. Sykes, Jr., et al. (Sykes 1998). The species breeds in eastern Asia from Amurland and Ussuriland to Manchuria and Korea, southwestern Japan, and China (see Vaurie 1959, OSJ 2000). It is an uncommon migrant in Japan as far north as Hokkaido and in southern Kurile Islands (OSJ 2000).

Pheucticus ludovicianus (Linnaeus, 1766) [type locality: Louisiana]. Rose-breasted Grosbeak. First records (no specimen; photos of each at UAM): ad. male, 15–16 August 1995, Fairbanks, J. E. Blackstone; female or immature male, 17–18 September 1998, Douglas, P. M. Suchanek et al. (FN 53:91). Subsequent reports include a first-year male, 5–9 October 2002, Juneau, M. McCafferty et al. (NAB 57:104). The Rose-breasted Grosbeak breeds as close to Alaska as northeastern British Columbia (Campbell et al. 2001); it is a casual or rare migrant elsewhere in western North America from southern British Columbia to Arizona (see AOU 1998). It was previously on the unsubstantiated list on the basis of a first-year male, 15 September 1986, Annette Island (M. E. Isleib and R. L. Scher, AB 41:131) and a one-year-old male, 15 June 1987, Mitkof Island (P. J. Walsh, AB 41:477).

Passerina amoena (Say, 1823) [type locality: near Canyon City, Colorado]. Lazuli Bunting. First substantiated record (no specimen; photos at UAM): a female visited a seed-feeder, 5–11 October 2000, Juneau (Douglas), P. M. Suchanek et al. (NAB 55:91). The species breeds as close to Alaska as southern interior British Columbia (Campbell et al. 2001). The Lazuli Bunting was previously on the unsubstantiated list on the basis of a singing male, 6 June 1985, Kake (D. J. Krueper, AB 39:340) and a one-year-old male, 10 June 1992, Hyder (T. G. Tobish, Jr., and L. J. Oakley, AB 46:1167).

Icterus spurius (Linnaeus, 1766) [type locality: South Carolina]. Orchard Oriole. One record (no specimen; photo published, additional photos on file at UAM): one probable female, 18 October 2002, Ketchikan, S. C. Heinl (NAB 57:104). The species breeds no closer to Alaska than southeastern Saskatchewan; it is a casual or rare migrant in the contiguous western United States (AOU 1998).

STATUS CHANGES

Gallinago delicata (Ord, 1825) [type locality: Pennsylvania]. Wilson's Snipe. Additional subspecies elevated to species rank. Maintained as the New World subspecies of the Common Snipe (*Gallinago gallinago*) from the 20th supplement (AOU 1945) until it was returned to species rank in the 43rd supplement "on basis of differences in winnowing display sounds associated with differences in the outer tail feathers (Thönen 1969, Tuck 1972, Miller 1996) that are comparable to differences between other closely related species in the genus" (Banks et al. 2002:899).

Wilson's Snipe breeds on the Alaska mainland (Gabrielson and Lincoln 1959) and in the eastern Aleutian Islands (Unimak specimens and nest/eggs examined, June). The Common Snipe is an annual spring and fall migrant in the western Aleutian Islands (see Byrd et al. 1978, Gibson 1981) and a casual migrant as far east as the central Aleutians (Adak specimens examined, May). Snipe are casual migrants on Alaska islands in Bering Sea. The first specimen of a snipe from the Pribilof Islands (September 1954) substantiated the first North American record of a Common Snipe (Kenyon and Phillips 1965), and specimens collected there since (11 examined, May and September) are all Common Snipe as well. Wilson's Snipe has been reported by experienced observers, but so far as we know there is no substantiated Pribilof record. One or the other of these species was recorded in spring at St. Matthew Island, but no

specimen was obtained (Winker at al. 2002). And at St. Lawrence Island, where the only records of snipe are recent (cf. Fay and Cade 1959, Sealy et al. 1971), some have been identified by observers as Common Snipe, some as Wilson's, and some have been left unattributed; the only specimen we know of from that island is a Common Snipe (17 May, examined).

Brachyramphus perdix (Pallas, 1811) (type locality: Tauisk Bay, Sea of Okhotsk). Long-billed Murrelet. Additional subspecies elevated to species rank. In New World literature *B. perdix* was first included as an extralimital species in a key to *Brachyramphus* by Ridgway (1919) and implicitly as such by AOU (1931); later it was maintained (again by implication) as an extralimital subspecies of *Brachyramphus marmoratus* (AOU 1957). The AOU (1997) first mentioned it explicitly in its 41st supplement, maintaining it as a full species on the basis of molecular evidence (Friesen et al. 1996). Three Alaska records include two from the 19th century and one from 20th (Sealy et al. 1991, Mlodinow 1997). The Long-billed Murrelet breeds around the Sea of Okhotsk and is known from adjacent waters, including east coast of Kamchatka (Vaurie 1965).

Vireo cassinii Xántus de Vesey, 1858 (type locality: Fort Tejon, California). Cassin's Vireo. Subspecies elevated to species rank. On the basis of studies by Murray et al. (1994) and Johnson (1995), the AOU (1997) split *Vireo solitarius* (Wilson, 1810) into three species. The first Alaska records of Cassin's Vireo, published by Gibson and Kessel (1992), included Alaska's first specimen (UAM 5321, adult male, 11 June 1986, Hyder, D. D. Gibson). Subsequently, Cassin's Vireo has been casual in spring and summer on the southeastern Alaska mainland—whence over 15 records through 2002, including a second specimen (UAM 6713, adult male, 3 July 1995, Stikine River, P. J. Walsh and S. C. Heinl)—and casual in summer in south-coastal Alaska, with two Anchorage records (NAB 53:422 and 55:471). Most records are from late May to July. The earliest date is 9 May (one at Point Bridget, Berners Bay, P. M. Suchanek, FN 52:375). The species breeds as close to Alaska as southern British Columbia (see AOU 1998).

Motacilla alba lugens Gloger, 1829 (type locality: Kamchatka). White Wagtail. Species relegated to rank of additional subspecies. In the Old World *lugens* has been all but invariably maintained by authorities as a subspecies of *M. alba* (e.g., see Hartert 1920, Dementiev and Gladkov 1954, Vaurie 1959, Johansen 1961, Voous 1977, Cramp 1988, OSJ 2000; cf. Stepanyan 1978). In the New World, where it breeds only peripherally, in Alaska, *lugens* was maintained by the AOU as a subspecies of *M. alba* from the 4th edition of the Check-list (AOU 1931) to the 34th supplement (AOU 1982), when it was elevated to the rank of species on the basis of a report of sympatry with limited hybridization with subspecies *M. a. ocularis* in Kamchatka (Kistchinski and Lobkov 1979—cited by AOU 1983). It is not clear to us how sympatry with limited hybridization differs from a zone of contact between two subspecies. For example, among the approximately 12 races of the White Wagtail (Vaurie 1959, Mayr and Greenway 1960), only the two easternmost, *lugens* and *ocularis*, share the black transocular line dividing the white face shared by all adult White Wagtails. All sex and age classes of *lugens* except the adult male have the back gray, not black, once again like *ocularis*, making identification of many intergrades or hybrids by phenotype difficult or problematic, in hand as well as in the field. Most recently, in a molecular study of the genus *Motacilla*, Voelker (2002:733) found *alba* and *lugens* to be paraphyletic with respect to one another and recommended that *lugens* "be considered conspecific with *alba*, or part of the *alba* superspecies complex, as it has been in the past ... until more complete analyses of their relationships can be performed."

DELETIONS

Sterna forsteri Nuttall, 1834 (type locality: Saskatchewan River). Forster's Tern. This species has been attributed to Alaska entirely on the basis of a specimen of questionable origin (see Gibson and Kessel 1997).

ADDITIONS TO UNSUBSTANTIATED LIST

Puffinus assimilis Gould, 1838 (type locality: Norfolk Island). Little Shearwater. Two reports from the Gulf of Alaska: one on 26 August 1996 at Gull Point, Kodiak Island (J. B. Allen); one on 12 October 1997 on the Gulf of Alaska off Resurrection Bay (at 59° 23′ N, 149° 03′ W) (R. H. Day, FN 52:108). In the Pacific Ocean, the species breeds in the southern hemisphere on islands off Australia and off New Zealand, at Norfolk Island, and in the Kermadec and Lord Howe groups (Mayr and Cottrell 1979). It is casual or accidental in the Hawaiian Islands (AOU 1998).

Ardea cinerea Linnaeus, 1758 (type locality: Sweden). Gray Heron. A heron identified as this species was observed 1–2 August 1999 at St. Paul Island, Pribilof Islands, by M. Greenfelder et al. (Burton and Smith 2001). In the Palearctic region, the Gray Heron breeds widely from the British Isles to Sakhalin and Japan (Vaurie 1965).

Porzana pusilla (Pallas, 1776) (type locality: Dauria). Baillon's Crake. A short-billed rail observed 20–21 September 2000 at Attu Island, Aleutian Islands, by J. Huntington et al. was tentatively identified as this species (NAB 55:89). In the Palearctic region, it breeds from Russia and southern Siberia east to Amurland, Ussuriland, and northern Japan (Vaurie 1965).

Myiarchus cinerascens (Lawrence, 1851) (type locality: western Texas). Ash-throated Flycatcher. A *Myiarchus* flycatcher identified as this species was observed on 20 July 1999 at Auke Bay near Juneau by G. B. van Vliet et al. (NAB 53:422). The photographs (at UAM) are inadequate to substantiate this identification. The species breeds in western North America, as far north as northwestern Oregon, eastern Washington, southern Idaho, and southern Wyoming; it is casual in southern British Columbia and Montana (AOU 1998).

Luscinia sibilans (Swinhoe, 1863) (type locality: Macao). Rufous-tailed Robin. A chat identified as this species was observed on 4 June 2000 at Attu Island, Aleutian Islands, by S. C. Heinl et al. (NAB 54:317). The photos (six color slides) and videotape on file at UAM are inadequate to substantiate this identification. The species breeds from south-central Siberia to Amurland, Sakhalin, and central Kamchatka (Vaurie 1959).

ACKNOWLEDGMENTS

We thank Kimball L. Garrett, Robert A. Hamilton, and Gary H. Rosenberg for their constructive reviews of this paper and Jon L. Dunn for his counsel.

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Accepted 16 October 2003

1994–1997 WATER BIRD SURVEYS OF LAKE POWELL, A LARGE OLIGOTROPHIC RESERVOIR ON THE COLORADO RIVER, UTAH AND ARIZONA

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ABSTRACT: We conducted monthly boat surveys of aquatic birds on Lake Powell from September to April each year from 1994 to 1997. The surveys were standardized in seven designated areas on the reservoir. Each survey took three days and was done by two experienced birders and a boat pilot. In all, we recorded 72,549 detections of 57 species on 19 monthly surveys. The most commonly detected species was the American Coot, followed by the Western Grebe; these two species accounted for 81% of all detections. Species rarely recorded in southern Utah and northern Arizona but found on the surveys included the Little Blue Heron, Barrow's Goldeneye, Greater Scaup, Herring Gull, Long-tailed Duck, Red-necked Grebe, Surf Scoter, and Pacific and Yellow-billed Loons. Species rarely recorded in winter for southern Utah and northern Arizona but detected on the surveys included the American White Pelican, Hooded Merganser, and Red-breasted Merganser. Lake Powell appears to be used primarily as a migratory stopover for aquatic species. Reservoir levels fluctuate greatly from year to year, preventing the growth of aquatic vegetation. Fish populations in the lake also fluctuate, and only in some years are sufficient to support winter populations of fish-eating species.

The widespread construction of dams for power generation and flood control throughout the world in the 20th century has created open-water habitats that in many regions had been lacking. These newly created habitats have been colonized by a variety of aquatic bird species (e.g., Rahmani 1989, Pandey 1993, Tremblay 1993, Su and Liu 1995, Rizzo and Patrizia 1999, Utschick 1998, 2000). Surprisingly little is known, however, about how reservoirs have affected the population sizes, migration patterns, or breeding distributions of aquatic species. To date, most studies in North America have focused on waterfowl use of particular food resources and associated habitats in reservoirs (e.g., McKnight and Hepp 1995, Benedict and Hepp 2000). In particular, despite the construction of numerous dams in the western U.S., little work has been done on waterbird colonization and use of reservoirs in the more arid regions of the southwestern U.S., over most of which large bodies of open water were absent from the end of the Pleistocene Epoch until the 20th century (Rosenberg et al. 1991, McCaw et al. 1996).

The construction of Glen Canyon Dam and the subsequent filling of Lake Powell in the southwestern U.S. created a large deep-water reservoir on the central Colorado Plateau (Figure 1). The dam was completed in 1963 and the lake began filling in 1964, reaching full pool in 1980. The reservoir covers 67,900 hectares (679 km^2) when at full-pool elevation of 1128 meters. Lake habitats have been in existence for 38 years. Since the dam was completed, a variety of aquatic bird species previously rare or unknown from the Colorado River region have been recorded on the reservoir.

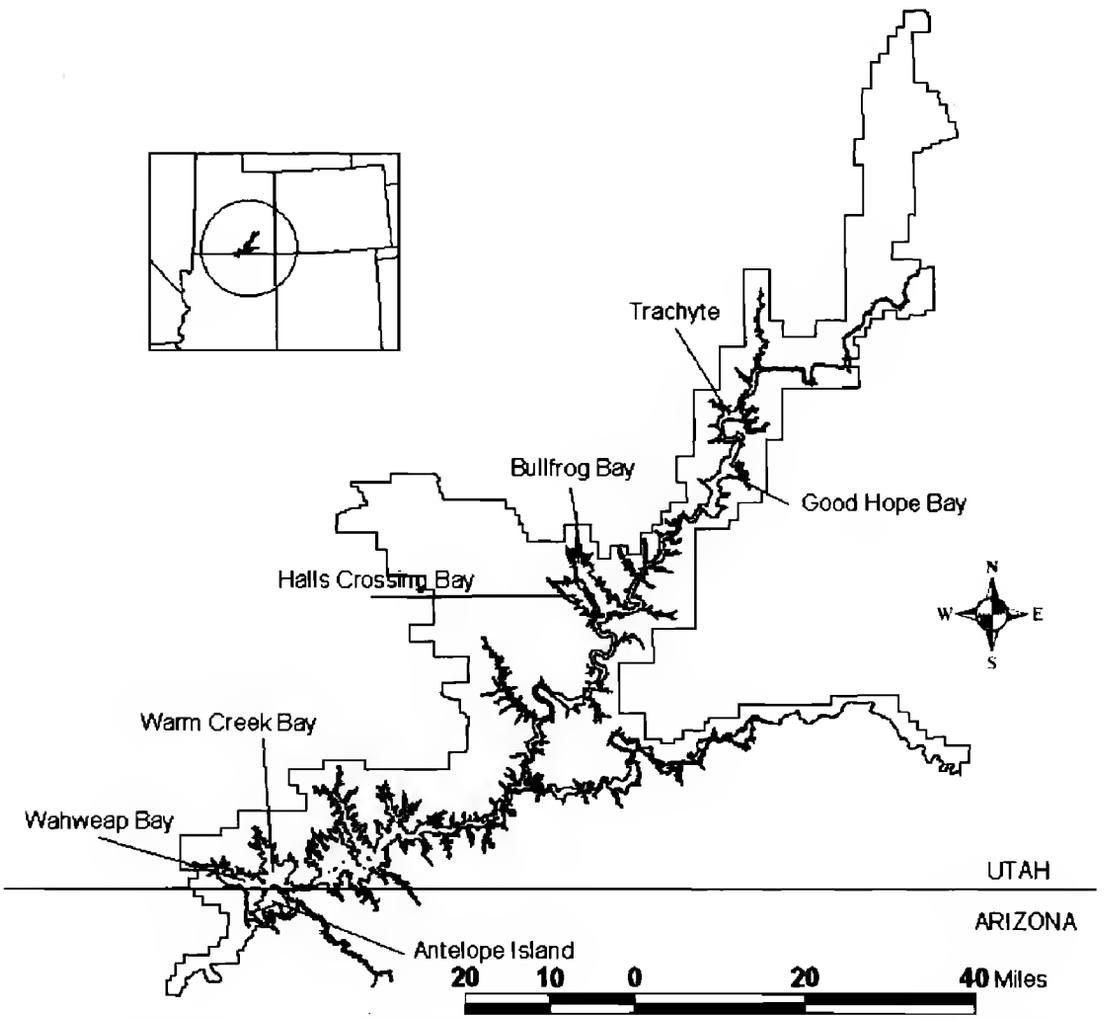

Figure 1. Seven sampling areas surveyed consistently throughout the survey period, 1994–1997. From south to north, the locations are Antelope Island, Wahweap Bay, Warm Creek Bay, Hall's Creek Bay, Bullfrog Bay, Good Hope Bay, and Trachyte.

Through 2001, 82 species of aquatic birds (see definition below) have been recorded on Lake Powell (LaRue et al. 2001), some in large numbers.

The Colorado River was originally a dynamic sediment-laden river with peak flows during spring flooding and minimum flows during the winter (Carothers and Brown 1991). Spring floods scoured out the river channel, preventing the establishment of aquatic vegetation. Primary productivity was low because of poor light penetration in the muddy waters. Early accounts indicate that few aquatic species occurred along the Colorado River prior to the construction of the many dams now regulating its flow (Behle and Higgins 1958, Carothers and Brown 1991, Rosenberg et al. 1991).

Grinnell (1914) conducted wildlife surveys along the lower Colorado River downstream of Needles in 1910 and noted only a few American Coots and dabbling ducks. The situation today is very different. The construction of large dams on the Colorado River created habitat for waterfowl and other aquatic species both above and below the dams. Hoover Dam was the first to be completed in 1936, creating Lake Mead. Other dams were soon built

downstream (Parker, Imperial, and Davis). The general effects of these dams have been to increase both wintering and breeding habitat for aquatic avifauna greatly (Rosenberg et al. 1991, Stevens et al. 1997). The clear cold waters below the dams create conditions conducive to the growth of aquatic vegetation, supporting large wintering populations of waterfowl. The deep reservoirs above the dams provide wintering habitat for a variety of aquatic birds, especially diving species such as grebes.

Prior to 1994, only two surveys had been completed on Lake Powell, and no systematic long-term winter surveys had been initiated. In January 1988 a lakewide survey was conducted, documenting 3715 individuals of 21 species (National Park Service data). In November 1992 a lakewide survey for the Western Grebe (no distinction was made between the two species of *Aechmophorus*) yielded 3619 individuals (National Park Service data). In February 1994 a survey in Warm Creek Bay revealed three species of loons, the Common, Pacific, and Yellow-billed. The Yellow-billed Loon was the second recorded in Utah.

In May 1994 the Resource Management Division of Glen Canyon National Recreation Area acquired a 32-foot Munson Hammerhead with a cruising radius of 10–12 hours. This boat offered ample speed, a stable platform for spotting scopes, and an enclosed cabin for winter survey work. Because of the lack of baseline data on wintering aquatic bird populations on Lake Powell, we initiated a systematic survey program in October 1994, continuing it through April 1997. This report documents the results of the three years of surveys. The primary goal of the program was to inventory selected areas on Lake Powell on a monthly basis to determine the numbers and kinds of migrant and overwintering aquatic birds.

SURVEY METHODS

We chose to use boat surveys for the project primarily because rare species are more likely to be detected and identified from boat surveys than from aerial surveys (cf. Stancill and Leslie 1990). Preliminary observations by boat and fixed-wing plane located areas of Lake Powell with significant concentrations of birds. On the basis of these observations, earlier reports, and the logistics of operating on a lake 295 km long, we designated seven areas for monthly surveys: Trachyte Canyon, Good Hope Bay, Bullfrog Bay, Hall's Creek Bay, Warm Creek Bay, Wahweap Bay, and Antelope Island (Figure 1). Antelope Island is in Arizona, while the other six survey areas are in Utah. No main channel reaches or narrow side canyons were included in the designated survey routes because few birds were seen in these areas.

Once a month between September and April, we conducted a three-day survey, starting at Good Hope Bay and Trachyte Creek on day 1, moving to Bullfrog and Hall's Creek bays on day 2, and ending at Warm Creek and Wahweap bays and Antelope Island on day 3. Fixed routes were followed along the shorelines of these seven survey areas. Most birds seen were individually identified and counted. Large rafts of Western Grebes and American Coots were occasionally encountered, however, and in some cases numbers had to be estimated. In these cases, two observers indepen-

dently estimated numbers, with an average taken where estimates were close (within 10%). If the estimates were different by more than 10%, then new counts were made until the estimates converged. We attempted to avoid double-counting individuals as a result of their movements. The counts reported in this paper are thus conservative. One assumption was that birds counted on different days did not move between survey areas over night. In general we made no attempt to distinguish between Clark's and Western Grebes in large rafts. We made occasional checks, however, to determine the percentage of Clark's and to document its presence on Lake Powell. In these checks the number of Clark's Grebe was always <1% of the flock number.

Data recorded for each bird or flock observed included location, time of day, species, habitat, behavior, and, where possible, sex and age. Incidental observations of birds were recorded while we were moving between designated survey areas but were not included in total numbers. Aquatic birds are defined as all members of the following: all families from Gaviidae through Anatidae and all families from Rallidae through Laridae (AOU 1998 sequence).

We determined the principal means of foraging on Lake Powell for each species, assigning it to one of four foraging guilds: aerialists (gulls, terns), dabblers (dabbling ducks), divers (diving ducks, coots, grebes, loons, cormorants, etc.), and waders (shorebirds, herons, etc.). Monthly surveys were conducted by two experienced bird observers. Because of stormy weather, boat problems, and government shutdowns, surveys were not conducted in November 1995 and October and December 1997. Partial surveys were conducted in March and April 1996, with only southern lake areas (Wahweap and Warm Creek bays, Antelope Island) surveyed. Seasons were defined as fall (September–November), winter (December–February), and spring (March–April).

RESULTS AND DISCUSSION

Between October 1994 and April 1997, 117 surveys over 19 months detected 57 species of aquatic birds in the seven survey areas. This figure represents 81% of the 70 aquatic species known from the reservoir by 1997. The two most common wintering species on Lake Powell were the American Coot and Western Grebe. These two species accounted for 81% of all recorded individuals (48% and 33% respectively). Other species with at least 1% of the total number recorded were the Gadwall (2.4%), Green-winged Teal (1.7%), Ring-billed Gull (1.5%), Common Goldeneye (1.3%), and Redhead (1.1%).

Several species rarely reported in Arizona and southern Utah were recorded during the surveys. These include the Little Blue Heron, Barrow's Goldeneye, Greater Scaup, Herring Gull, Long-tailed Duck, Pacific Loon, Red-necked Grebe, Surf Scoter, Wood Duck, and Yellow-billed Loon. Unusual winter (December–February) records were obtained for several additional species, including the American White Pelican, Hooded Merganser, and Red-breasted Merganser.

Surveys prior to 1960 had recorded 24 species of aquatic birds along the Colorado River and its main tributaries from the Glen Canyon Dam site to Hite (Table 1; Woodward 1958, Behle and Higgins 1959, Behle 1960). Between 1960 and 1963 an additional 12 species were recorded in the area, primarily near the dam site (National Park Service files). Since 1964 an additional 44 species have been recorded, the most recent being the first record of the Yellow-footed Gull for Utah and Arizona. The bird, an adult, was discovered on 21 April 1999 in Wahweap Bay in Utah and then relocated later the same day near Antelope Island in Arizona (Rosenberg and Benesh 1999).

Because far more people, including birders and government biologists, have been visiting the region since the completion of Glen Canyon Dam, the large increase in number of species in the last 30 years may be more a reflection of number of observers rather than actual "discovery" of the reservoir by aquatic species. Earlier surveys and visitors were few, and most were during the spring and summer months when the Colorado River was most easily run. It is thus likely that some of the species recorded since 1964 may have occurred in the region earlier but went unrecorded.

The two most common habitats in which birds were recorded were drowned tamarisk (*Tamarix ramosissima*) in shallow water near shore and large shallow bays of open water. Very few birds were seen along the rocky shorelines that constitute >90% of Lake Powell's margin. The American Coot, other diving species, and the majority of the dabbling ducks were associated with drowned tamarisk. Growth of algae and in some cases aquatic vascular plants, with their associated invertebrates along with small fish, presumably provide the primary food for these species. In the larger shallow bays such as Warm Creek or Hall's Creek bays (Figure 2) were the large concentrations of Western Grebes. These birds were often seen diving for food, most likely schools of small fish such as the threadfin shad (*Dorosoma petenense*).

Lake Powell provides relatively poor habitat for dabbling ducks. Because of fluctuations in reservoir levels of 10 to 15 meters per year, extensive aquatic vegetation cannot develop. Rather, a thin layer of algae, primarily *Chara*, attached to boulders and drowned tamarisk stems, provides the only food for dabblers. Recently, however, the exotic aquatic vascular plant *Najas marina* has appeared in the reservoir and is spreading rapidly along beaches. The ability of this species to provide food for dabblers in the fluctuating reservoir remains unknown. In general, most dabblers peak in fall and spring migration, and only a few hundred typically winter on Lake Powell.

The abundance of fish-eating diving species such as grebes, cormorants, loons, and mergansers varied greatly from year to year. Counts of the Western Grebe, the most common fish-eating diving species on the reservoir, were high when numbers of small fish in Lake Powell were high (unpublished National Park Service data). Counts of the Western Grebe on Lake Powell, however, rarely exceeded 5000 individuals, well below numbers known from natural lakes. In years when fish numbers were low, relatively few diving species lingered past December. It is perhaps significant

Table 1 Water Birds Detected 1994–1997 on Lake Powell, Glen Canyon National Recreation Area, Utah and Arizona

Species	Pre-dam presence[a]	Number of detections	Percentage of surveys detected
Pacific Loon *Gavia pacifica*		7	26
Common Loon *Gavia immer*		109	95
Yellow-billed Loon *Gavia adamsii*		5	26
Pied-billed Grebe *Podilymbus podiceps*	X	377	100
Horned Grebe *Podiceps auritus*		92	58)
Red-necked Grebe *Podiceps grisegena*	X	3	16
Eared Grebe *Podiceps nigricollis*	X	636	100
Western Grebe *Aechmophorus occidentalis*		23,712	100
Clark's Grebe *Aechmophorus clarkii*		17	42
American White Pelican *Pelecanus erythrorhynchos*	X	9	21
Double-crested Cormorant *Phalacrocorax auritus*	X	547	89
Great Blue Heron *Ardea herodias*	X	138	95
Great Egret *Ardea alba*	X	2	11
Snowy Egret *Egretta thula*	X	2	11
Little Blue Heron *Egretta thula*		1	5
Cattle Egret *Bubulcus ibis*		2	5
Black-crowned Night-Heron *Nycticorax nycticorax*	X	2	5
White-faced Ibis *Plegadis chihi*	X	107	11
Canada Goose *Branta canadensis*	X	166	79
Snow Goose *Chen caerulescens*		1	5
Wood Duck *Aix sponsa*		1	5
Gadwall *Anas strepera*	X	1764	100
American Wigeon *Anas americana*	X	183	63
Mallard *Anas platyrhynchos*	X	534	95
Blue-winged Teal *Anas discors*	X	58	11
Cinammon Teal *Anas cyanoptera*	X	67	32
Northern Shoveler *Anas clypeata*	X	323	79
Northern Pintail *Anus acuta*	X	588	79
Green-winged Teal *Anas carolinensis*	X	1270	84
Redhead *Aythya americana*	X	822	89
Ring-necked Duck *Aythya collaris*		719	63
Greater Scaup *Aythya marila*		6	11
Lesser Scaup *Aythya affinis*	X	654	84
Surf Scoter *Melanitta perspicillata*		2	11
Long-tailed Duck *Clangula hyemalis*		4	21
Bufflehead *Bucephala albeola*	X	515	84
Common Goldeneye *Bucephala clangula*	X	970	74
Barrow's Goldeneye *Bucephala islandica*		10	11
Hooded Merganser *Lophodytes cucullatus*		31	32
Common Merganser *Mergus merganser*	X	733	95
Red-breasted Merganser *Mergus serrator*		168	68
Ruddy Duck *Oxyura jamaicensis*	X	303	74
American Coot *Fulica americana*	X	34,985	100
Killdeer *Charadrius vociferus*	X	4	11

(continued)

Table 1 (Continued)

Species	Pre-dam presence[a]	Number of detections	Percentage of surveys detected
American Avocet *Recurvirostra americana*	X	13	11
Greater Yellowlegs *Tringa melanoleuca*		5	11
Lesser Yellowlegs *Tringa flavipes*		3	11
Long-billed Curlew *Numenius americanus*		6	5
Willet *Catoptrophorus semipalmatus*		22	11
Marbled Godwit *Limosa fedoa*		218	16
Franklin's Gull *Larus pipixcan*	X	80	16
Bonaparte's Gull *Larus philadelphia*		2	5
Mew Gull *Larus canus*		1	5
Ring-billed Gull *Larus delawarensis*	X	1124	100
California Gull *Larus californicus*	X	418	58
Herring Gull *Larus argentatus*		4	21
Forster's Tern *Sterna forsteri*		4	5

[a]Species recorded in area prior to building of Glen Canyon Dam.

that the most common wintering species on Lake Powell was the American Coot, a generalist that has a broad array of foraging behaviors.

Because of the timing of the surveys, some species groups were not detected in this study. Regionally, the bulk of fall shorebird migration takes place in August and September, and we conducted relatively few surveys in September. The only survey month that yielded good numbers of shorebirds was April, when flocks of Marbled Godwits were often found. Because of the shoreline of Lake Powell is so long (about 2000 miles at full-pool elevation) it is likely that many shorebirds were missed simply because of the amount of available habitat. Other groups not well represented in the survey data include phalaropes, terns, jaegers, and Sabine's Gull. Wilson's and Red-necked Phalaropes tend to migrate through the region in a short interval of a week or so in late March (National Park Service files), and none of the surveys in that month apparently coincided with this window. In fall, these species tend to be more diffuse in their migration, and also typically move through in the largest numbers in late August. Most tern species migrate through the Lake Powell area in May or August and were also missed because of the survey times. Jaegers are extremely rare in the region for unknown reasons, with only a single documented sighting of an adult Parasitic Jaeger over Wahweap Bay on 21 September 2000 (LaRue et al. 2001). Finally, Sabine's Gull moves through the Lake Powell region in very small numbers (four records of 10 individuals) during a short period between about 18 and 25 September (LaRue et al. 2001) and was missed on the 1994–1997 surveys.

The results presented in this paper are similar to survey results at reservoirs in the lower Colorado River Valley such as Lake Havasu and Mohave Lake (Rosenberg et al. 1991). The relative abundance of the species in the two areas is similar, but many more birds winter in the lower

Figure 2. Drowned Fremont Cottonwood (*Populus fremontii*) in upper Hall's Creek Bay, 29 November 1994. This area consistently supports high numbers and diversity of aquatic birds, including most of the wintering population of Double-crested Cormorants on Lake Powell.

Photo by J. D. Grahame/National Park Service

valley than on Lake Powell. This difference is probably due to a combination of milder winters, a greater amount of food and other resources in the older reservoirs, and adjacent wildlife refuges and non-dammed segments of the Colorado River. One major difference between the two regions is that Clark's Grebe is very rare on Lake Powell but common in the lower valley (Rosenberg et al. 1991). It is fairly common on Lake Mead as well (Spence pers. obs.). Reasons for this difference are unknown but may be related to different migration patterns of the two species within the Intermountain West flyway.

ANNOTATED SPECIES LIST

The following list details our results for the 57 species seen in one or more of the seven designated survey areas during the 19 months of surveys. Table 1 summarizes the counts for each species.

Pacific Loon (*Gavia pacifica*). A rare migrant and possible winter resident. Seven records, of one in October 1994, two in October 1995, one in January 1996, two in November 1996, and one in April 1997. The species has been seen in all survey areas except Antelope Island and Good Hope Bay. There is a slight possibility for some of the early records to have been of the Arctic Loon, unrecorded inland in the western United States, although the last three individuals were carefully identified as the Pacific Loon.

Common Loon (*Gavia immer*). A rare but regular migrant and winter resident, with records from every survey month except September 1995. Peak numbers are recorded between December and February. The largest single count was five birds on Warm Creek Bay on 15 February 1996. Common Loons are generally solitary on Lake Powell.

Yellow-billed Loon (*Gavia adamsii*). A Yellow-billed Loon was first seen on 10 February 1994 on Warm Creek Bay prior to our launching the lake surveys. The bird associated with both Common and Pacific Loons. The second record was on 21 December 1994, again on Warm Creek Bay. The bird then moved to Wahweap Bay, where it was seen twice opposite the Coves, on 15 February and 15 March 1995. Very likely this same bird returned the next year, with sightings on Warm Creek Bay on 15 February and 15 March 1996.

Pied-billed Grebe (*Podilymbus podiceps*). An uncommon but regularly seen species, with records from all survey months. Numbers tend to peak in late fall and winter (November–January). A majority of the records are from 1994–95, when the species was particularly common on Lake Powell. The largest count was of 39 on Wahweap Bay in 20 January 1995.

Horned Grebe (*Podiceps auritus*). Prior to 1996–97 a rare fall and spring migrant, with only two winter records, of single birds on Good Hope Bay on 18 January 1995 and on Bullfrog Bay on 14 February 1996. For unknown reasons the species was relatively common on Lake Powell during 1996–97, with 84 detections that year compared with seven in 1994–95 and one in 1995–96. During the five months surveyed, counts included 16 in November, 10 in January, 11 in February, 29 in March, and 18 in April. The single largest count was of 12 birds around Antelope Island on 21 March 1997.

Red-necked Grebe (*Podiceps grisegena*). A rare winter and spring migrant, with three records of single birds, 20 January 1996 and 17 January 1997 on Warm Creek Bay and 21 March 1997 near Antelope Island. These are the first records for Glen Canyon National Recration Area and Lake Powell.

Eared Grebe (*Podiceps nigricollis*). A common fall and uncommon spring migrant, often lingering in small numbers through the winter. The largest group seen during surveys was 168 on Wahweap Bay on 23 January 1997.

Western Grebe (*Aechmophorus occidentalis*). Common to abundant; the second most common species on Lake Powell during the survey period. Western Grebes generally occur in rafts ranging from a dozen up to 1700 at the mouth of Trachyte Creek on 20 November 1996. Traditionally, large numbers have been seen at this location, Good Hope Bay, and Bullfrog Bay. There is a strong gradient of increasing numbers from the dam toward Hite at the far northern end of the lake (National Park Service unpublished data). Peak numbers tend to occur in fall or early winter (October–December), coinciding with southbound migration. A smaller peak occurs in March and April as well. Large numbers were counted in fall and winter of 1995–96 and 1996–97, coinciding with relatively high populations of the threadfin shad.

Clark's Grebe (*Aechmophorus clarkii*). A rare migrant in spring (April) and fall (September–November). The occasional inspection of rafts of Western Grebes indicated that <1% of these flocks are Clark's. There is only one winter record, of one on Good Hope Bay on 18 January 1995. Generally this species occurs as single birds or more often pairs at the upper ends of bays, associated with drowned tamarisk.

American White Pelican (*Pelecanus erythroryhnchos*). Pelicans generally migrate through the area in August and were missed on the surveys. However, two birds lingered at Wahweap Bay from 20 October through 21 December 1994. A single bird was observed on Bullfrog Bay from 29 November 1994 to 19 January 1995.

Double-crested Cormorant (*Phalacrocorax auritus*). A common fall migrant and winter resident on some bays, especially Hall's Creek Bay. Numbers peak in fall and winter, and generally most birds are gone by March or April. The largest flock was of 41 on upper Hall's Creek Bay on 19 October 1994.

Great Blue Heron (*Ardea herodias*). A rare year-round resident, with migrants augmenting residents during the winter. The largest groups were of seven birds each at Bullfrog Bay on 14 March 1995 and Wahweap Bay on 14 March 1996.

Great Egret (*Ardea alba*). A very rare spring migrant, with two records. Single adults were seen along the shores of Wahweap Bay on 20 April 1995 and 12 April 1996.

Snowy Egret (*Egretta thula*). A rare spring migrant to the shores of Lake Powell, with only two records of single birds, at Bullfrog Bay on 14 March 1995 and Warm Creek Bay on 18 April 1997.

Little Blue Heron (*Egretta caerulea*). Extremely rare migrant, with a single record of an immature at upper Wahweap Bay on 21 September 1995.

Cattle Egret (*Bubulcus ibis*). Rare spring migrant. Two birds were seen along the shores of Wahweap Bay on 18 April 1997.

Black-crowned Night Heron (*Nycticorax nycticorax*). Rare migrant. Two birds were seen on 12 April 1996 in tamarisk at the head of Warm Creek Bay.

White-faced Ibis (*Plegadis chihi*). Small flocks occur regularly in April during northbound migration. These flocks often linger into May and early June in the Wahweap area. The largest flock was of 46 birds on 17 April 1997 at Bullfrog Bay.

Canada Goose (*Branta canadensis*). An uncommon fall and spring migrant on Lake Powell, generally not lingering in winter. The largest flock of 46 birds was seen on Warm Creek Bay on 21 March 1997. This species overwinters commonly at the Page sewage-treatment plant and the adjacent golf course.

Snow Goose (*Chen caerulescens*). Very rare winter visitor. A single bird was seen with a flock of American Coots off Antelope Island on 6 December 1995.

Wood Duck (*Aix sponsa*). A very rare winter visitor, with a single record of a male that remained at Bullfrog Marina from November 1994 to February 1995 (Figure 3).

Gadwall (*Anas strepera*). A common species, seen in all survey months. Numbers peak in winter and early spring (especially March) during migration. The largest flock was of 103 birds on Hall's Creek Bay on 19 January 1996.

American Wigeon (*Anas americana*). An uncommon species, generally seen only in fall (October) and spring (March) migration. Large flocks of this species overwinter regularly on golf courses at Page, so apparently the lake does not provide proper foraging habitat for wigeons. The largest flock was of 42 birds on Warm Creek Bay on 15 March 1995.

Mallard (*Anas platyrhynchos*). An uncommon resident and common wintering species, encountered in small flocks in most survey areas, with peak numbers in December and January. Mallards were scarce in the winter of 1995–96. The largest flock was of 56 birds on Hall's Creek Bay on 29 November 1994.

Blue-winged Teal (*Anas discors*). An uncommon migrant in the Lake Powell area, with only a few sightings of small flocks in September and October 1995. The largest flock was of 30 on Wahweap Bay on 20 October 1995. Because of difficulties in distinguishing birds in eclipse plumage, some teal seen during the study were left unidentified and could have been either this species or the Cinnamon Teal.

Figure 3. Male Wood Duck at Bullfrog Marina, 20 December 1994. This bird stayed most of the winter 1994–1995 and became extremely tame.

Photo by J. R. Spence/National Park Service

Cinnamon Teal (*Anas cyanoptera*). A rare spring (March–April) and early fall (September) migrant, with few birds detected prior to 1997. In 1997 small flocks were seen in scattered locations, with the largest being 10 on Warm Creek Bay on 21 March 1997 and 14 on Wahweap Bay on 18 April 1997.

Northern Shoveler (*Anas clypeata*). An uncommon migrant and winter resident, scarce in 1995–96. Relatively large numbers were seen in spring of 1997, with 91 in March and 189 in April. The largest flock was of 90 birds at the mouth of Trachyte Creek on 16 April 1997.

Northern Pintail (*Anas acuta*). An uncommon fall and spring migrant and winter resident, scarce in 1995–96. Relatively large numbers were seen in late winter 1997, with 255 birds on Wahweap Bay and 185 on Warm Creek Bay on 21 February 1997.

Green-winged Teal (*Anas crecca*). An uncommon fall and early spring migrant, with peak numbers in October, February, and March. A few birds linger through the winter. The largest flocks were seen on 21 March 1997, with 165 around Antelope Island and 152 on Wahweap Bay.

Redhead (*Aythya americana*). Common migrant and winter resident. Birds start appearing in October and peak in December–January. A few linger into April. Redhead numbers peaked on 21 December 1994 and 20 January 1995, when flocks of 191 and 175, respectively, were seen on Wahweap Bay. Numbers of Redheads were very low in 1995–96, while more were seen in 1996–97, including a flock of 164 on Warm Creek Bay on 23 January 1997.

Ring-necked Duck (*Aythya collaris*). Common migrant and winter resident, with numbers peaking in December and January. Like other waterfowl, this species was

scarce on Lake Powell in the winter of 1995–96. The largest flock seen was of 141 on 17 January 1997 on Warm Creek Bay.

Greater Scaup (*Aythya marila*). Very rare migrant; two records. A single bird was seen flying over Bullfrog Bay on 20 January 1995, and a flock of five was seen flying over Wahweap Bay on 14 March 1996. The Greater Scaup is a rare but regular overwintering species on the Colorado River below Glen Canyon Dam, with most records between December and February (LaRue et al. 2001).

Lesser Scaup (*Aythya affinis*). A relatively common fall migrant and winter resident, with small flocks most often seen on Wahweap Bay and around Antelope Island. Lesser Scaup start appearing in October and most are gone by March. The largest flock was of 89 individuals on Wahweap Bay on 21 March 1997. This is one of the more common overwintering species on the Colorado River below Glen Canyon Dam (LaRue et al. 2001).

Surf Scoter (*Melanitta perspicillata*). Rare migrant; two records. A female-plumaged bird was seen on Wahweap Bay on 20 October 1994 (Figure 4), while another female-plumaged bird was seen on Hall's Creek Bay on 19 April 1995. This species has also been recorded several times from the Colorado River below Glen Canyon Dam (LaRue et al. 2001).

Long-tailed Duck (*Clangula hyemalis*). Rare winter resident and migrant; three or four records. A male was seen on Hall's Creek Bay on 19 January 1996, then again on 14 February 1996. A bird of unknown sex on Hall's Creek Bay on 13 March 1996 may have been the same individual. A bird of unknown sex was seen on Warm Creek Bay on 22 November 1996.

Figure 4. Female Surf Scoter on Wahweap Bay, 20 October 1994. The bird appeared to be exhausted and flew only when we approached very close in the survey boat.

Photo by J. D. Grahame/National Park Service

Bufflehead (*Bucephala albeola*). A common winter resident first appearing in October, with peak numbers between December and February. The species is mostly gone by March. Buffleheads frequent the upper ends of shallow bays, especially Bullfrog and Hall's Creek bays. The largest counts were of 54 on 20 December 1995 and 52 on 19 January 1996, both on Bullfrog Bay.

Common Goldeneye (*Bucephala clangula*). A common winter resident, with small flocks occurring in most survey areas, appearing in November, but most common between December and February. A few individuals linger into March. The largest single count was of 136 on Hall's Creek Bay on 14 February 1996. Numbers were much lower in 1996–1997 than in the previous two years. The Common Goldeneye is one of the most common overwintering species on the Colorado River below Glen Canyon Dam (LaRue et al. 2001).

Barrow's Goldeneye (*Bucephala islandica*). Rare winter resident; two sightings. A flock of eight was on Hall's Creek Bay on 19 February 1996, and two birds were on Wahweap Bay on 21 December 1995. On the Colorado River below Glen Canyon Dam, however, small flocks overwinter regularly (LaRue et al. 2001).

Hooded Merganser (*Lophodytes cucullatus*). Uncommon to rare migrant. Very small numbers move through the region in late fall and early winter (November–January), with a single spring record of a male on Hall's Creek Bay on 14 March 1995. The largest flock was of 13 birds on Warm Creek Bay on 29 November 1994.

Common Merganser (*Mergus merganser*). Common migrant and winter resident, with records from most survey months. Numbers peak in December and January. This species was much more common in 1995–96 than in the other years of the study. The largest flock was of 48 birds on Warm Creek Bay on 15 January 1996. The species is a common resident breeder on the Colorado River below Glen Canyon Dam (LaRue et al. 2001) and occasionally breeds on Lake Powell.

Red-breasted Merganser (*Mergus serrator*). Regular migrant in small numbers, with highest counts in early winter and spring. In the winter of 1996–97 several birds overwintered, e.g., 18 in January and 12 in February. The largest count was of 26 on Hall's Creek Bay on 13 March 1996.

Ruddy Duck (*Oxyura jamaicensis*). Uncommon fall and spring migrant, most common in October. A few birds lingered over the winter of 1996–97. The largest count was of 80 birds off Antelope Island on 27 October 1995.

American Coot (*Fulica americana*). Abundant species over the three years of the study, particularly between November and January. American Coots accounted for over 48% of all bird sightings. They were abundant in 1994–95 and common again in 1996–97. In 1995–96, however, numbers were very low except in December of 1995. The single largest count was of 3906 on Warm Creek Bay on 23 January 1997. Coots forage in a variety of ways, but on Lake Powell they generally dive in very shallow water, foraging on algae growing on rocks or drowned vegetation, associated crustaceans, and possibly small fish. Coots are strongly concentrated around the margins of shallow bays with abundant drowned tamarisk, habitat that is especially common in Bullfrog, Warm Creek, and Wahweap bays.

Killdeer (*Charadrius vociferus*). Killdeer are common migrants in the Page area but are apparently very rare on Lake Powell. Our surveys generated only two records, of a single bird at Bullfrog Bay on 29 November 1994 and three birds on Antelope Island on 18 April 1997. This species, like other smaller shorebirds, may be more common than the numbers indicate, probably easily overlooked from a boat on the water.

American Avocet (*Recurvirostra americana*). Rare; four sightings. Single birds were at Wahweap Bay on 12 April 1996 and near Antelope Island on 18 April 1997.

A flock of seven was at Wahweap Bay on 18 April 1997, and a group of four was at Bullfrog Bay on 17 April 1997.

Greater Yellowlegs (*Tringa melanoleuca*). Rare winter lingerer and early spring migrant with two records, of two at Bullfrog Bay on 15 February 1996 and three in the same area on 18 April 1997.

Lesser Yellowlegs (*Tringa flavipes*). Rare spring migrant; one record. Three birds were at Wahweap Bay on 18 April 1997.

Long-billed Curlew (*Numenius americanus*). Rare spring migrant, with a single record of six birds off Antelope Island on 12 April 1996.

Willet (*Catoptrophorus semipalmatus*). Rare spring migrant; three records. At Wahweap Bay two birds were with Marbled Godwits on 20 April 1995 and four birds were sighted on 18 April 1997. The largest flock of 16 birds was at Hall's Creek Bay on 17 April 1997. Otherwise this species is a sparse migrant in spring and fall at sewage-treatment ponds in the Page area (LaRue et al. 2001).

Marbled Godwit (*Limosa fedoa*). Uncommon but regular migrant in April, most likely to be seen at Wahweap Bay or around Antelope Island. The largest flight was of 168 birds on 20 April 1995 in the southern portion of the lake: 100 at Wahweap Bay, 60 on Antelope Island, and 8 at Warm Creek Bay.

Franklin's Gull (*Larus pipixcan*). Small numbers of Franklin's Gulls migrate through the Lake Powell area in April and May. Most sightings were from southern survey areas or Bullfrog Bay. April 1997 was a particularly good month, with 59 birds counted in four survey areas. The largest flocks were of 14 over Bullfrog Bay on 17 April 1997 and 43 over Wahweap Bay on 18 April 1997. On 2 May 1997, 65 birds were counted at the Wahweap sewage-treatment plant, about 1 mile from Lake Powell (LaRue et al. 2001). The numbers reported in the spring of 1997 are unprecedented for the U.S. Southwest, as most Franklin's Gulls migrate east of the Rocky Mountains (Burger and Gochfeld 1994). Regionally, most sightings are of single individuals or very small groups (Rosenberg et al. 1991).

Bonaparte's Gull (*Larus philadelphia*). Rare migrant. One record of two birds over Wahweap Bay on 27 October 1995.

Mew Gull (*Larus canus*). Rare migrant. One record of a second-year bird at Wahweap Marina from 30 November to 21 December 1996. It was the first Mew Gull recorded for Lake Powell and Glen Canyon National Recreation Area.

Ring-billed Gull (*Larus delawarensis*). Common winter resident. Ring-billed Gulls start appearing at Lake Powell in late September; they depart by late April or early May. The largest count was of 359 on 13 and 14 March 1996, with the single largest survey count of 205 on 14 March 1996 over Wahweap Bay.

California Gull (*Larus californicus*). Common migrant in spring (March–April), especially in the southern portions of the lake, but rare on fall and winter surveys. There are records for every month over the three years of surveys except January. The largest count was of 205 birds over Wahweap Bay on 12 April 1996.

Herring Gull (*Larus argentatus*). Rare migrant. Four records of single first-winter birds, at Hall's Creek Bay on 19 October 1994 and 13 March 1996, Warm Creek Bay on 5 December 1996, and Wahweap Bay on 23 January 1997.

Forster's Tern (*Sterna forsteri*). Although this species is a common fall and spring migrant through the region in May and late August or early September, sometimes in large flocks (e.g., 150 on a small island off northeast point of Antelope Island on 11 May 1995), it was recorded only once during the surveys. Four were over Bullfrog Bay on 18 April 1997.

ACKNOWLEDGMENTS

We especially thank A. J. Pinnock and John D. Grahame for their help in organizing and initiating the project. We gratefully acknowledge the numerous biologists and birders who helped on one or more surveys, including Nikolle Brown, Aaron Flesh, Chris Florian, Chris Goetze, Chuck LaRue, Laurie Ness, Brenda Russell, Elliot Swarthout, and Mark Wotawa. Boat pilots were Tony Napolitan and Tom Haberle, who endured long hours of "get us closer to that bird" being shouted at them. John Ritenour, chief of the resource-management division, provided support and encouragement. The project was conducted with Glen Canyon National Recreation Area ONPS base funding. We are grateful to Ken Rosenberg and Steve Summers, who reviewed the draft manuscript.

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Accepted 24 September 2003

FOREST OWLS DETECTED IN THE CENTRAL SIERRA NEVADA

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ABSTRACT: We recorded detections of other species of forest owls while surveying for the Spotted Owl (*Strix occidentalis*) in the central Sierra Nevada from 1 April to mid-August, 1997–2002. During 4562 Spotted Owl surveys, we recorded 355 responses from six other owl species: the Northern Saw-whet (*Aegolius acadicus*), Northern Pygmy (*Glaucidium gnoma*), Flammulated (*Otus flammeolus*), Great Horned (*Bubo virginianus*), Long-eared (*Asio otus*), and Western Screech (*Otus kennicottii*). We did not detect the Great Gray (*Strix nebulosa*) or Barred (*S. varia*). After correcting for annual variation in survey effort, we estimated that detection rates for most species varied annually in a similar pattern. Most owl responses were recorded during April and May. These incidental detections are useful for documenting the presence of owl species in the central Sierra Nevada and suggesting potential future research.

Documenting the presence of forest owls can be difficult because these birds are often found in dense vegetation, may have large home ranges, may inhabit rough terrain, and are nocturnal (Fuller and Mosher 1981, McLeod and Andersen 1998). Owls usually respond most frequently to calls of their own species (Fuller and Mosher 1981, Bosakowski and Smith 1998). Therefore, some researchers recommend broadcasting sequences of different species' calls to estimate composition of owl communities (Fuller and Mosher 1981). Although this approach can be time-consuming, it has merit because it probably elicits species-specific responses. Nevertheless, broadcast surveys of a single species are sometimes used to elicit responses from and to locate other woodland raptors (Fuller and Mosher 1981, McLeod and Andersen 1998). Here we report the complement of other owl species we detected over a large study area during surveys for the Spotted Owl (*Strix occidentalis*).

STUDY AREA AND METHODS

We conducted our study from 1997 to 2002 in the central Sierra Nevada near Georgetown, El Dorado County, California. The 355-km^2 Eldorado Density Study Area (EDSA) lies within the Eldorado National Forest. Its elevation ranges from 366 m to 2401 m. The EDSA is typical of middle-elevation Sierran montane forest as described by Küchler (1977) but has been logged extensively in the past.

We recorded detections of all species of owls in the Sierra Nevada opportunistically as part of a larger demographic study in which Spotted Owls were surveyed annually from 1 April through mid-August by methods described by Forsman (1983) and Franklin et al. (1996). The entire EDSA was surveyed each year, including habitat types not necessarily associated with the Spotted Owl. We established a system of approximately 375 call-

point stations along trails and roads that provided complete coverage of the study area. We used these call-point surveys to elicit responses from Spotted Owls to determine the general locations of their territories. Each point was surveyed twice per year. At each point, observers alternated between imitating Spotted Owl calls and listening for a response for 10 minutes. If a territory was occupied, then a "walk-in" survey was conducted to identify an individual Spotted Owl. These surveys took place at dusk and dawn and entailed an observer's hiking through the forest, actively searching for and visually identifying Spotted Owls.

We conducted surveys at times when Spotted Owls were most likely to be detected, that is, call-point surveys at night, "walk-in" surveys at dawn and dusk. Most surveys (83.9%) were conducted between 1800 and 0100 PST, with 9.7% between 0300 and 0500 (Figure 1). Observers recorded date, time, and location of all owl species detected during surveys. Surveys were not conducted during inclement weather such as precipitation or winds exceeding 30 km/hr. Surveys were conducted within a temperature range of −15° to 27° C. We standardized survey effort by accounting for the number of surveys during the course of the study. Survey effort increased gradually through the study, with approximately 25% more surveys conducted in 2002 than in 1997. In addition, more surveys were conducted later in May, June, or July than in other months. Therefore, we defined detection rate as the number of other owl observations (aural or visual) divided by the total number of Spotted Owl surveys within a given time period. We identified owls primarily by vocalizations (>95%), although we included visual detections. Because these detections were opportunistic, for a variety of reasons they are not suited to statistical analysis.

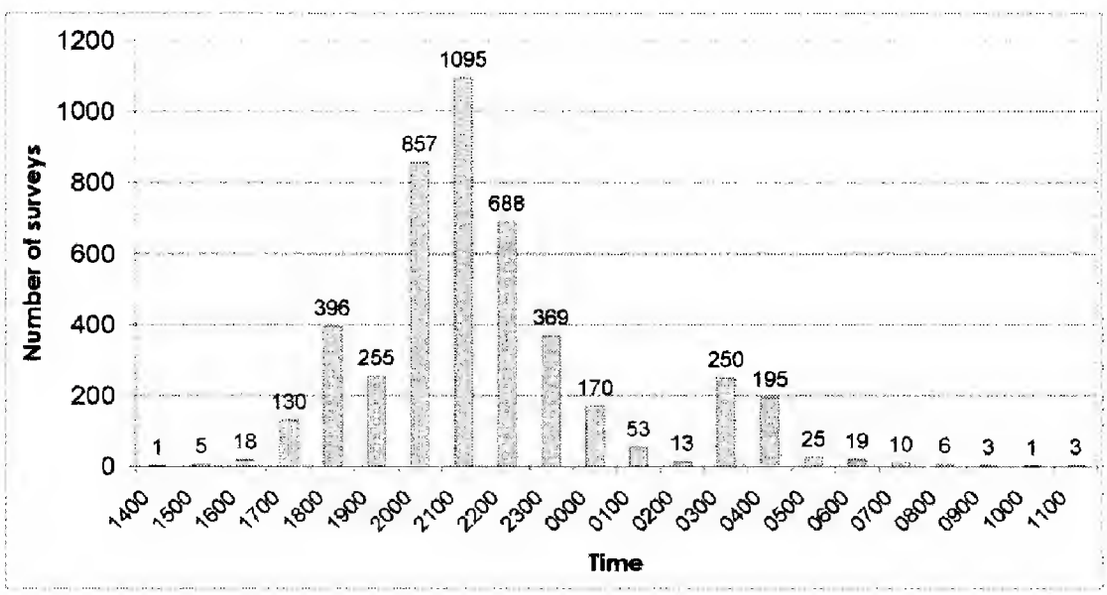

Figure 1. Total number of surveys by hour of survey initiation, 1997–2002. Totals include both "walk-in" and point counts.

RESULTS

We recorded 355 detections of six owl species during 4562 Spotted Owl surveys over the 6-year period. In order of most to least detections, we recorded the Northern Saw-whet Owl (*Aegolius acadicus*), Northern Pygmy-Owl (*Glaucidium gnoma*), Flammulated Owl (*Otus flammeolus*), Great Horned Owl (*Bubo virginianus*), Long-eared Owl (*Asio otus*), and Western Screech-Owl (*Otus kennicottii*). Detection rates varied from year to year. Other owl species were detected during 3.9 to 11.1% of Spotted Owl surveys each year. The annual detection rates of the four most commonly observed species (Northern Saw-whet, Northern Pygmy, Flammulated, and Great Horned) varied in a similar pattern (Figure 2). Species' detection rates also varied seasonally (Figure 3); detection rates were highest in April or May, declined during the summer, but increased again in August.

Forest owl detections were not distributed evenly across the study area. Flammulated Owl detections had limited spatial overlap with Great Horned Owl detections. We encountered the Great Horned Owl primarily on the eastern, higher-elevation side of the study area, the Flammulated primarily on the lower-elevation western side. We detected the Long-eared on the western side, primarily in riparian areas along the Rubicon River. We found

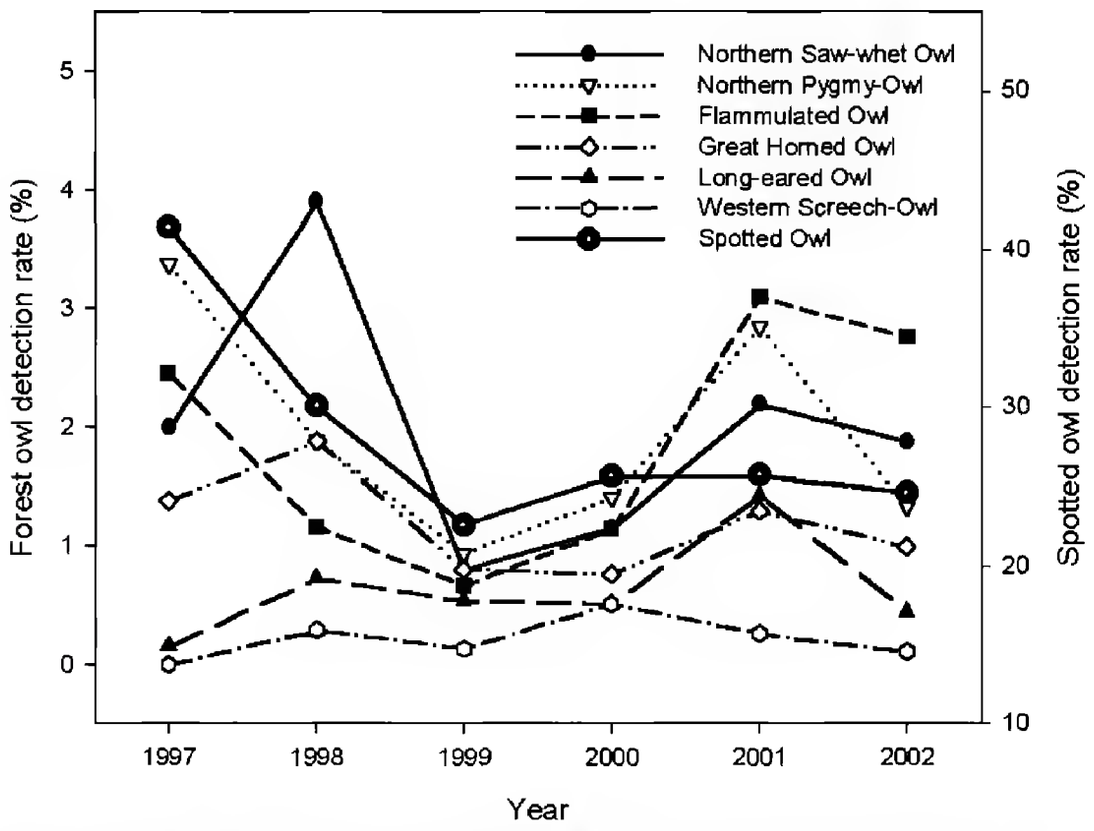

Figure 2. Annual detection rates of forest owl species during Spotted Owl surveys, 1997–2002. Detection rate (%) was calculated as number of responses divided by number of Spotted Owl surveys × 100 during a given year. For comparison of relative changes in detection rate, results for the Spotted Owl are displayed on a different scale.

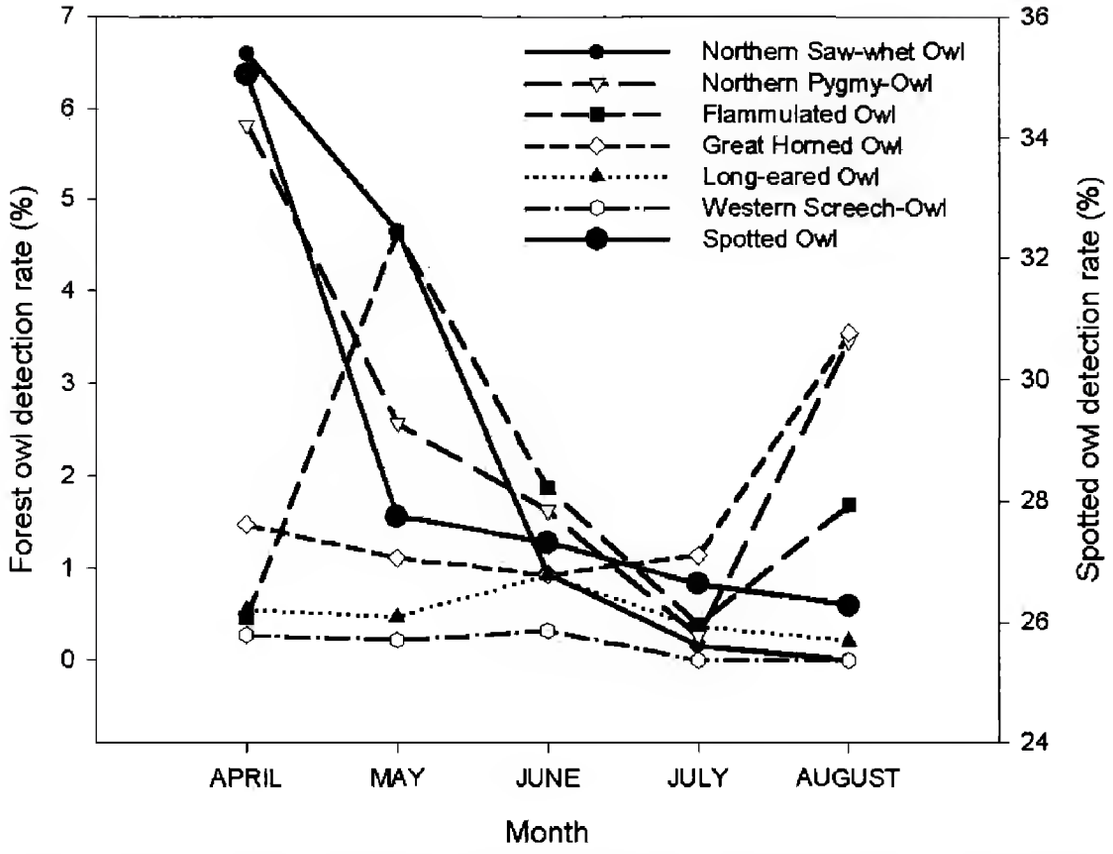

Figure 3. Seasonal detection rates of owl species during Spotted Owl surveys, 1997–2002. Seasonal detection rate was calculated as number of detections divided by number of Spotted Owl surveys × 100 during a given month. For comparison of relative changes in detection rate, results for the Spotted Owl are displayed on a different scale.

Northern Saw-whet Owls and Northern Pygmy-Owls throughout the study area.

DISCUSSION

Owl species we detected in this area were similar to those expected (Verner and Boss 1980). Although we did not find the Great Gray Owl (*Strix nebulosa*) or Barred Owl (*Strix varia*), habitat suitable for these two species probably exists within the EDSA. Verner and Boss (1980) noted that the mixed conifer and red fir habitat in Placer and El Dorado counties could support the Great Gray. Most of our surveys were completed by 0100, but Mikkola (1983) reported that Great Gray Owls may be more responsive later at night. Thus we may not have been surveying at an ideal time for detecting the Great Gray. Because our survey effort was most concentrated between 1800 and 0100, we may have also failed to detect owls with different activity cycles. For example, the Northern Pygmy-Owl is largely diurnal (Holt and Petersen 2000), while the Great Horned may be most responsive after midnight (Morrell et al. 1991, but see Houston et al. 1998). The Long-eared Owl in particular may be most responsive from 0200 to 0400, a time when

our survey effort was much lower (Jon Winter pers. comm.). For this reason, we cannot infer abundance from our observations but can only compare relative responsiveness by month and year, intervals for which survey effort can be standardized, and denote presence but not absence of owls in these areas.

The Barred Owl's range expansion is of particular interest because this species may affect the Spotted Owl negatively (Dark et al. 1998). Barred Owls have expanded recently into the Pacific Northwest and California (Evans and LaValley 1982, Dark et al. 1998). More recently, Barred Owls have been located in the Sierra Nevada (G. Gould, California Dept. of Fish and Game, pers. comm.). Because Barred Owls respond to vocal imitations of Spotted Owls (Herter and Hicks 2000), it was of considerable interest that we detected no Barred Owls in the EDSA. However, a "Sparred Owl," or Spotted × Barred Owl hybrid, was found in the study area in 2003 (Seamans et al. unpublished data). Continued surveys are needed to monitor the Barred Owl's range expansion.

From 1997 to 2002, the annual variation in detection patterns of small owl species (Northern Saw-whet, Flammulated, and Northern Pygmy) resembled that in the Spotted Owl (Gutiérrez et al. 2002, Franklin et al. in press). Although Spotted Owl detection rates were much higher than those for other species because we were actively seeking the Spotted, all owl detections declined sharply in 1999, a year when both reproduction and recapture rates for the Spotted Owl were very low (Seamans et al. 2001, Franklin et al. in press). Since the area, survey method, and survey effort were similar each year, we hypothesize that the same biological or environmental factors are linked to these changes in all four species. In the Spotted Owl, changes in reproduction and survival have been correlated with weather, particularly precipitation (Franklin et al. 2000, Seamans et al. 2002). Weather could affect the owls indirectly (rainfall affecting dynamics of the owls' primary prey) or directly (increasing energetic demands or impeding hunting success) (Franklin et al. 2000).

Our detections cannot be used as indices of owl abundance because each species may vary in its response to Spotted Owl calls. Marcot and Hill (1980) noted that Flammulated Owls respond readily to Spotted Owl calls. Johnson (1993) reported that Great Horned Owls also respond to Spotted Owl calls, although at approximately one fourth the rate of response to calls of conspecifics.

Our results suggest that biologists interested in evaluating the entire forest owl community could survey most efficiently in April or May when many owls, particularly the smaller species, responded most frequently. The schedule of vocalizations, related largely to the courtship period, closely followed our expectations of seasonal activity patterns based on a review of the literature. Spotted Owl detections were higher in April because we conducted more "walk-in" surveys at this time; we deliberately surveyed areas where Spotted Owls were detected in the previous year first in order to increase the chance of encountering banded individuals again. However, higher detection rates may be confounded by interactions between survey effort and changes in the owls' responsiveness while courting and nesting. We detected Northern Saw-whet Owls primarily during the courtship period

ending in early May, although unmated males can sing into May or June (Cannings 1993, Clark and Anderson 1997). We detected Northern Pygmy-Owls and Flammulated Owls most frequently during April and May respectively, but they vocalized throughout the season (Holt and Petersen 2000, Marcot and Hill 1980, McCallum 1994). Great Horned Owls, which breed in winter, were heard consistently throughout the season, with no peak in May and a slight increase in detections during August. Houston et al. (1998) reported that male Great Horned Owls begin advertising in late September or early October. Thus, we probably missed the peak of Great Horned Owl calling.

We noted differences between the distributions of the Great Horned and Flammulated Owls in comparison with the general distribution of forest habitat (Verner and Boss 1980). Besides differences in habitat use, Great Horned Owls may have reduced Flammulated Owl abundance by predation, and/or the presence of Great Horned Owls may have suppressed vocalizing by Flammulated Owls. Johnson (1993) detected Great Horned Owls at elevations higher than the average elevation of his calling stations (elevation break occurred above 945 m). In Mono County, California, Shuford and Fitton (1998) found the Great Horned Owl widespread (41 of 74 atlas blocks), the Flammulated sparse (only 4 of 74 atlas blocks). Limited spatial overlap between territories has also been observed in other studies of owl communities (Solonen 1993, Galeotti and Gariboldi 1994), but irregularities in nest spacing may be due to uneven distribution of suitable habitat (Solonen 1993).

These data suggest future avenues of investigation for those interested in the distribution, abundance, and status of all owl species in the Sierra Nevada. They also suggest that for several species of owls surveys would be best conducted during May.

ACKNOWLEDGMENTS

This study was funded by the U.S. Forest Service (contract #FS53-91S8-00-EC14 to Gutiérrez) and the University of Minnesota. We thank the many technicians who assisted with this project. Andrea Chatfield, Jennifer Fox, and Guthrie Zimmerman read drafts of this paper or provided helpful suggestions. We thank Tim Manolis, Jon Winter, and Bruce Webb for helpful comments during the review process.

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Accepted 3 October 2003

SPECIMEN RECORD OF A LONG-BILLED MURRELET FROM EASTERN WASHINGTON, WITH NOTES ON PLUMAGE AND MORPHOMETRIC DIFFERENCES BETWEEN LONG-BILLED AND MARBLED MURRELETS

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ABSTRACT: On 14 August 2001, Robert Dice found a *Brachyramphus* murrelet approximately 12 miles east of Pomeroy in eastern Washington state more than 200 miles from the nearest marine waters. The bird died later that day. It had begun definitive prebasic body molt, but not flight feather molt. Necropsy indicated that the bird was a female, probably in her second calendar year. Johnson and Thompson identified the bird as a Long-billed Murrelet, *Brachyramphus perdix*, on the basis of plumage and measurements; it is the first specimen of this species for Washington state. Contrary to many recent publications stating that Long-billed and Marbled Murrelets have white and brown under wing coverts, respectively, we confirmed that both species typically have white under wing coverts prior to definitive prebasic molt and brown under wing coverts after this molt. Absence of any extensive storm systems in the North Pacific in the days preceding 14 August suggest that the specimen discussed here became disoriented during postbreeding migration rather than having been blown inland by easterly winds.

At approximately 1100 PST on 14 August 2001, Robert Dice, an upland wildlife restoration biologist with Washington State Department of Fish and Wildlife, found a moribund robin-sized brownish bird on a rural county road approximately 12 miles west of Pomeroy, Garfield County, eastern Washington. The location is near the border of Idaho, approximately 210 and 270 miles from the nearest point in Puget Sound and the Pacific Ocean, respectively. The bird was apparently heat-stressed because the ambient temperature was 90–95° F. Dice took the bird to the home of a local resident and tried to resuscitate it, but it died at about 1600 that afternoon. The bird was taken to Washington State University in Pullman, where Johnson tentatively identified it as a Long-billed Murrelet, *Brachyramphus perdix*. Pullen prepared the specimen (KJP 4328) as a round study skin with an associated extended wing (Spaw 1989, Winker 2000) and sent it to Thompson to confirm its identity.

IDENTIFICATION OF THE SPECIMEN

The specimen was a female with a mature ovary (13 × 6 mm) and slightly enlarged ova (2 mm), indicating the bird was at least one year old. The bird's

plumage further corroborates this conclusion: its ventral feathers were broadly edged with brown, giving the breast and belly a scalloped or mottled appearance, typical of adult Long-billed and Marbled Murrelets, *Brachyramphus marmoratus*, in first and definitive alternate plumage (Thompson unpubl. data). In contrast, the breast and belly of both of these species are finely flecked with brown in juvenal plumage in their first summer and fall, are completely white in first basic plumage except for a small percentage of birds that retain some juvenal breast and belly plumage in their first winter and subsequent spring, and are always completely white in definitive basic plumage (Thompson unpubl. data). In addition, the bird was in the early stages of definitive prebasic body molt (e.g., lesser and median wing coverts) but had not yet begun flight-feather molt.

Long-billed Murrelets have bills about 15% to 30% longer, on average, than those of Marbled Murrelets (Table 1); as a result, Sealy et al. (1991) suggested that birds with bills exceeding 18 mm can reliably be identified as the Long-billed. Long-billed Murrelets also are generally larger in overall body size than Marbled Murrelets, as reflected by a variety of standard body measurements (Table 1).

Table 1 Measurements of an Adult Female Long-billed Murrelet from Eastern Washington in Relation to Those of Adult Female Marbled and Long-billed Murrelets[a]

Measurement	Marbled Murrelet	Specimen from eastern Washington	Long-billed Murrelet
Exposed culmen	17.4 ± 0.9, 108[b]	19.6	21.2 ± 0.7, 5[c]
Bill depth	5.7 ± 0.3, 107[b]	6.2	6.6 ± 0.1, 5[c]
Tarsus length	16.9 ± 0.6, 107[b]	19.1	18.3 ± 0.3, 5[c]
Wing (flattened)			
Adults"	124.1 ± 3.5, 45[d, e]		142.9 ± 4.7, 5[c]
Juvenal[f]	115.6 ± 4.4, 10[d]	132	131.0 ± 2.8, 2[g]
Tail length			
"Adults"	31.7 ± 1.6, 7[f, g]		35.9 ± 1.5, 5[h]
Juvenal[f]	30.9 ± 0.7, 5[g]	31	31, —, 1[g]

[a]All measurements in millimeters. Data presented as mean ± standard deviation, *n*.

[b]Data from "adult females" in British Columbia (Sealy 1975).

[c] Data from California Academy of Sciences 68017, Hoffman and Woolfenden (1988), and Sealy et al. (1991).

[d] Data from specimens in University of Washington Burke Museum, University of California Museum of Vertebrate Zoology and California Academy of Sciences.

[e] Data from probable adult females, i.e., specimens exhibiting evidence of breeding (brood patch, enlarged ovaries and/or oviduct) and/or with no bursa of Fabricius; these birds have likely replaced their juvenal primaries at least once.

[f]Data from females with discernible retained juvenal plumage. These birds have not replaced their juvenal primaries.

[g] Data from specimens in University of Washington Burke Museum.

[h]Data from Stejneger (1886), Hoffman and Woolfenden (1988), Sealy et al. (1991: U.S. National Museum 599498), and University of Washington Burke Museum 44434 and 44435.

Similarly, many plumage characters also have been argued to be reliable indicators of one species or the other in alternate plumage. It has been claimed that in alternate plumage Long-billed Murrelets have (1) more pronounced white crescents or arcs immediately above, and especially below, the eye than do Marbled Murrelets (Stejneger 1886, Ridgway 1919, Jehl and Jehl 1981, Harrison 1983, Sibley 1993, Piatt et al. 1994, Konyukhov and Kitaysky 1995), (2) entirely dark plumage above their gape, whereas Marbled Murrelets often have a pale stripe above their gape (Sibley 1993, Konyukhov and Kitaysky 1995), and (3) a completely dark maxilla, whereas the maxilla of Marbled Murrelets is always partially white (Konyukhov and Kitaysky 1995). Lethaby's (2000) subsequent evaluation of these plumage differences, however, found them to be unreliable.

Two additional characters, wing lining and outer rectrix color, also have been suggested as consistent differences between the Long-billed and Marbled Murrelets. The wing lining (underwing coverts) of Marbled Murrelets usually has been described as dark, e.g., "dusky brown" to "smoky brownish black" (Coues 1868), "clear ash" (Barrows 1877), "smoky gray" (Baird et al. 1884), "grayish brown" to "dusky gray" (Stejneger 1886), and "uniform fuscous" (Ridgway 1919). In contrast, National Geographic's *Field Guide to the Birds of North America* (4th ed., 2002), Gaston and Jones (1998: plate 8), and Sibley (2000) illustrate the under wing coverts of Long-billed Murrelets as being extensively white. Similarly, Lethaby (2000) noted that most (13 of 15) Long-billed Murrelets in alternate plumage that he examined had "obvious pale feathering on the under wing coverts" and concluded that "presence of extensive pale in the under wing coverts is strongly supportive, *but not diagnostic* (italics his), for alternate-plumaged Long-billed Murrelets."

However, Lethaby's tentative conclusion is incorrect. Indeed, many authors have previously noted that Long-billed Murrelets have wing linings that are brownish or vary in color from white to brown. Specifically, Dement'ev and Gladkov (1951) stated that the wing lining of adult Long-billed Murrelets is "grayish" or "gray-brown." Sealy et al. (1991) published a ventral photo of a Long-billed Murrelet specimen with its wings partially outstretched that clearly shows dark under wing coverts. Oka (1999) described two of three Long-billed Murrelets that he assumed were adults as having "brown" and "dark brown" under wing coverts. In contrast to these previous descriptions of underwing-covert color in the Long-billed Murrelet, Shibaev (1990) noted that these coverts may vary from "solidly brownish-gray" to almost white. Lethaby (2000) also noted that 2 of 15 Long-billed Murrelets he examined had "all-dark" under wing coverts.

This apparent discrepancy has arisen because in both the Marbled and Long-billed Murrelets the color of the underwing coverts is an indicator of age. In the Long-billed Murrelet this variation was recognized more than a century ago by Taczanowski (1893), who stated that the under wing coverts of adults are "gray-brown," whereas those of second-year birds are "white with a little brown"; Dement'ev and Gladkov (1951) subsequently noted Taczanowski's findings. Kozlova (1957) also stated that underwing coverts of adults are "brownish-gray" whereas those of birds in juvenal plumage are "brownish gray with some white."

Regarding the Marbled Murrelet, Coues (1868:64) noted that the underwing coverts of birds in juvenal and first basic plumage vary from being dark as in adults (e.g., USNM 46547) to being "dusky along the edge of the wing, but...elsewhere variegated with dull whitish" (e.g., USNM 46542). Nelson (1997) also noted that underwing coverts of birds in juvenal plumage are "brownish gray with some white," whereas those of birds in definitive basic and definitive alternate plumage are "uniform fuscous" and "uniform gray brown," respectively. Lethaby (2000) subsequently noted that "virtually all" Marbled Murrelets (n = 34) in juvenal, first basic, and first alternate plumage "showed at least some and often extensive white in the under wing coverts," whereas all birds in subsequent definitive basic and alternate plumages (n = 33) "showed completely dark under wings."

Thompson examined additional Long-billed and Marbled murrelet specimens (see acknowledgments for museums) and corroborated that wing-lining color in these species is an indication of age and not a species-specific character; nine of nine hatch-year Long-billed Murrelets in juvenal or first basic plumage (aged by retention of juvenal plumage and/or bursa size) had white wing linings (underwing coverts), whereas four of five birds in alternate plumage had brown wing linings. Similarly, for the Marbled Murrelet, 89% (64 of 72) of hatch-year birds in juvenal or first basic plumage had white wing linings, whereas 91% (160 of 176) of birds in alternate plumage or definitive basic plumage had brown wing linings. In addition, Marbled Murrelets banded as juveniles and recaptured as second-year birds typically have white wing linings (F. Cooke, N. Parker, L. McFarlane Tranquilla, unpubl. data). This suggests that in most cases specimens in alternate plumage that have white wing linings probably are second-year birds. The specimen found in eastern Washington has a white wing lining (Figure 1), suggesting that it was a second-year bird, though reproductively mature (discussed above). This is unusual, however, because Marbled Murrelets, and presumably Long-billed Murrelets, are generally believed to reproduce for the first time in the third, rather than their second, calendar year of life (Beissinger 1995, DeSanto and Nelson 1995).

Second, although this character was not mentioned by Mlodinow (1997) or Lethaby (2000), Dement'ev and Gladkov (1951), Konyukhov and Kitaysky (1995) and Shibaev (1990) stated that the outer vane of the outermost rectrices (rectrix 6) of Long-billed Murrelets has "more or less well-developed white marbling," "a narrow, white marginal stripe," and "narrow fringes or mottles (white with reddish)," respectively, whereas Marbled Murrelets do not exhibit this character. Kozlova (1957) stated that the outer rectrices of adult Long-billed Murrelets "occasionally" have "narrow white margins and brownish dots," whereas birds in juvenal plumage always have "white bars" on their outer rectrices. However, only 4 of 16 Long-billed Murrelets that Thompson examined possessed whitish or buff on their outermost rectrices, so absence of this character does not identify specimens as Marbled Murrelets. Conversely, none of the 464 Marbled Murrelet specimens we examined had any white in the outer rectrices, so such a pattern appears to be a reliable criterion for identifying the Long-billed Murrelet in the hand.

In alternate plumage, the most reliable field character "for separating the two species is the pale throat of the Long-billed Murrelet: The chin and sides

Figure 1. Ventral view of the wing of the Long-billed Murrelet specimen (Charles R. Conner Museum [Washington State University] no. 01-37) found dead in eastern Washington state on 14 August 2001.

of the throat all the way to the base of the neck are pale.... In contrast, Marbled Murrelets do not show pale sides to the throat" (Lethaby 2000). In the hand, but to a lesser degree in the field, the most accurate plumage character for discriminating between these species in alternate plumage is the presence of "cinnamon-edged" or "rufous" feathers in the mantle and scapulars of the Marbled but not the Long-billed (Ridgway 1919, Piatt et al. 1994, Lethaby 2000).

The specimen found in eastern Washington is clearly a Long-billed Murrelet on the basis of its pale throat, lack of any rufous on its mantle (Figure 2; photos also at http://www.ups.edu/biology/museum/LBMU01-37.jpg [round skin]), and slight whitish edges on its outermost rectrices.

Measurements of the specimen also support its being a Long-billed Murrelet; its exposed culmen of 19.6 mm and tarsus of 19.1 mm are too long for a Marbled Murrelet (Table 1). The relatively short wing (chord 132 mm) and tail (31 mm) of the specimen support our suggestion that it is a second-year bird, i.e., a bird with retained juvenal flight feathers shorter than those of subsequent generations of flight feathers worn by older birds (Table 1).

POSSIBILITY OF HYBRIDIZATION

Although the Long-billed and Marbled Murrelets appear to be more similar to one another in plumage color and morphology than to any other alcid species, they are not sister taxa. Genetic evidence indicates that the Kittlitz's Murrelet, *Brachyramphus brevirostris*, is the Marbled Murrelet's sister species (Pitocchelli et al. 1995, Zink et al. 1995, Friesen et al. 1996a, b, 1997). Hybridization between Kittlitz's and Marbled murrelets is unknown. Thus it is unlikely that Long-billed and Marbled Murrelets would hybridize even if their breeding ranges were partially sympatric, but their breeding ranges are not known to overlap. However, identifying a Long-billed X Marbled Murrelet hybrid may be impossible except by genetic methods. Examination of the population genetics of Marbled Murrelets from Alaska and the Aleutian Islands, including specimens from Adak (n = 5) and

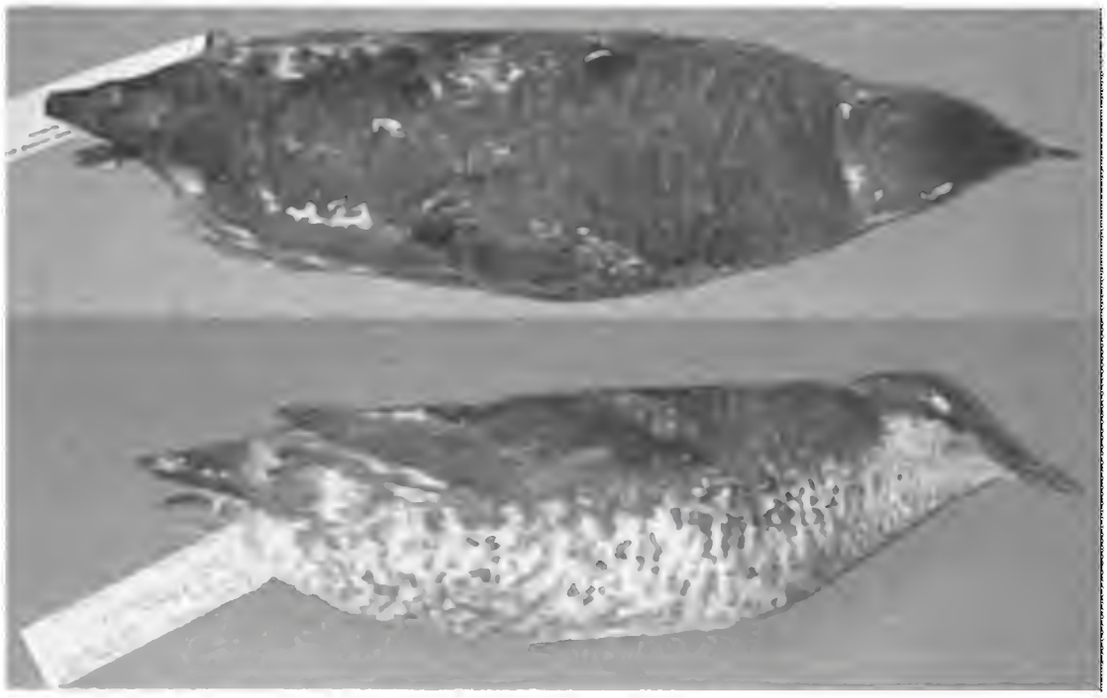

Figure 2. Dorsal (top) and lateral (bottom) view of the Long-billed Murrelet specimen (Charles R. Conner Museum [Washington State University] no. 01-37) found dead in eastern Washington state on 14 August 2001.

Attu (n = 9), found no evidence of hybridization with the Long-billed Murrelet (Congdon et al. 2000). It is likely that Marbled Murrelets breed as far west as Adak (Kessel and Gibson 1978) and possibly as far west as Attu (Sealy et al. 1982) in the Aleutian Islands, about 300 km east of the Commander Islands, the easternmost possible breeding locality of the Long-billed Murrelet. Thus, it is possible, though probably unlikely, that these species hybridize in the western Aleutian Islands.

BREEDING AND WINTERING RANGE OF THE LONG-BILLED MURRELET

The Long-billed Murrelet breeds in Russia on the Kamchatka Peninsula, the Kuril Islands, Sakhalin Island, and along the northern and western shores of the Sea of Okhotsk and Sea of Japan south to Olga Bay (Stejneger 1898, Labzyuk 1987, Konyukhov and Kitaysky 1995, Nelson 1997). There are also summer records from Japan on eastern Hokkaido, suggesting the birds may breed there in small numbers, possibly only intermittently (Brazil 1991); recent evidence of breeding is lacking (Nelson et al. 1997). Summer records of Long-billed Murrelets from the Commander Islands (Hartert 1920, Kuzyakin 1963), just west of the Aleutians, also suggest that the species may breed there as well; however, Stejneger (1885) did not report seeing them in the vicinity of the Commander Islands, and Kozlova (1957) stated that Long-billed Murrelets "certainly do not breed" there.

The Long-billed Murrelet is more migratory than the Marbled, typically wintering about 500 miles south of its breeding locations, mainly in the

vicinity of Sakhalin Island, Hokkaido, Honshu (including inland lakes; Oka 1999), with smaller numbers as far south as coastal waters of Kyushu, Amami-O-shima, and Kume-jima (Japan), and China, North Korea, and South Korea (Austin 1948, Vaurie 1959, Nechaev 1986, Shibaev 1990, Brazil 1991, Nelson 1997; see distribution maps in Konyukhov and Kitaysky 1995, Mlodinow 1997).

POSSIBLE EXPLANATION FOR THIS VAGRANT RECORD

Vagrancy in seabirds is common, especially in procellariids (Bourne 1967), but also in some alcids (Bent 1919, Grinnell 1938, Porsild 1943, Salomonsen 1944, Munyer 1965, Nero 1968, Sealy et al. 1971, Roberson 1980, Pitman et al. 1983). Among alcids, however, some species are much more prone to vagrancy than others; for example, the Ancient Murrelet, *Synthliboramphus antiquus* (Munyer 1965, Smith 1966, Verbeek 1966, Sealy and Carter 1980), Dovekie, *Alle alle* (Murphy and Vogt 1933, Sprunt 1938, Snyder 1953), and Parakeet Auklet, *Aethia psittacula* (Jones et al. 2001) are frequent vagrants whereas most other alcids are not.

Because the Long-billed Murrelet's breeding range is much farther from the west coast of North America than the Marbled Murrelet's, one would expect more vagrants in North America of the Marbled than of the Long-billed. However, the opposite is true: there is not a single inland record of a vagrant Marbled Murrelet for North America. In contrast, more than 50 vagrant Long-billed Murrelets have been recorded inland throughout the United States and Canada (Sealy et al. 1991, Langridge 1994, DiLabio 1996, Mlodinow 1997, Anon 1998, Grzybowski 1998, Roberson et al. 1998, 1999, Ellison and Martin 1999, Gilligan 1999, Lubahn 1999, Sundell 1999, Tessen 1999, Domagalski 2000, Korducki 2000, Martin 2000, Rottenborn and Morlan 2000, Erickson and Hamilton 2001, Burgiel et al. 2002, Kratter et al. 2002), and even Europe (Knaus and Balzari 1999, Maumary and Knaus 2000a, 2000b). This may be because the Long-billed Murrelet is more migratory than the Marbled (Konyukhov and Kitaysky 1995). The current record is the seventh documented record, first specimen record, and only inland record for Washington state (Skriletz 1996, Aanerud and Mattocks 1997, 2000, Mlodinow 1997, Aanerud 2002).

Mlodinow (1997) suggested that the Long-billed Murrelet is more predisposed to vagrancy because it is more migratory than the Marbled Murrelet. Most vagrant Long-billed Murrelets have occurred from early July through late August or from late October through early December (Mlodinow 1997). Because July and August correspond to the normal period of fledging and postbreeding dispersal/migration, Mlodinow (1997) suggested that vagrant records from this time period may represent birds that became disoriented during normal postbreeding dispersal/migration. Similarly, Mlodinow (1997) found a tendency for records from October through December to be correlated with "storms that occurred off the east coast of Asia between Japan and the Kamchatka Peninsula within two to three days of each record." He also found records of the Long-billed Murrelet significantly more frequent when the mid-tropospheric atmospheric circulation (about three

miles above the Earth's surface) tracks from the Gulf of Alaska and North Pacific into the interior of Alaska.

Robert Dice, who found the specimen in eastern Washington, told Thompson that a severe storm had occurred in the area the previous night. However, our review of broader regional climatic conditions in Washington state and west across the North Pacific between 11 and 14 August found no large-scale severe storm systems in the Pacific Northwest or North Pacific Ocean during that time. As a result, we suspect that this specimen became disoriented during postbreeding migration as suggested by Mlodinow (1997) but was grounded locally by a storm.

ACKNOWLEDGMENTS

We thank Fred Cooke, Nadine Parker, and Laura Tranquilla McFarlane for access to unpublished data on Marbled Murrelets. Russ Bradley, Janet Hinshaw, Falk Huettemann, Kim Nelson, Hal Opperman, Dennis Paulson, and Terry Wahl provided citations and photocopies of literature regarding the Long-billed Murrelet. Janet Hinshaw, Ian Jones, Alexander (Sasha) Kitaysky, Jevgeni Shergalin, and Francis Weise provided translations of Russian and French literature. George Divoky provided relevant climatological data. Dennis Paulson and Joe Morlan provided extensive comments on drafts of the manuscript that greatly improved the paper. Dennis Paulson also provided the photographs. For access to their bird collections, we thank Doug Long (California Academy of Sciences), Leo Joseph (Philadelphia Academy of Natural Sciences), Ned Johnson, Carla Cicero, and Chris Conroy (Museum of Vertebrate Zoology, University of California, Berkeley), Dennis Paulson (Slater Museum of Natural History, University of Puget Sound), and Rob Faucett, Sievert Rohwer, and Chris Wood (Burke Museum, University of Washington). Dennis Paulson also helped verify the specific identity of the specimen discussed in this paper.

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Accepted 24 September 2003

NOTES

CALIFORNIA QUAIL LAYS EGG IN WILD TURKEY NEST

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Intraspecific nest parasitism has evolved several times in the order Galliformes and has been documented for at least 32 species (Geffen and Yom-Tov 2001, Yom-Tov 2001). Reports of interspecific nest parasitism in this order are much less common than for egg dumping among conspecifics (Lyon and Eadie 1991). Below we describe an instance of egg laying by California Quail (*Callipepla californica*) in the nest of a Wild Turkey (*Meleagris gallopavo*). This record represents the first report of nest parasitism between these two species.

We observed the following interaction at the Hastings Natural History Reservation in Carmel Valley, Monterey County, California, during a study of the mating system of Wild Turkeys. On 22 April 2002, we located a Wild Turkey nest by tracking a radio-tagged female to a nest in a wooded ravine of coast live oak (*Quercus agrifolia*), California buckeye (*Aesculus californica*), and California bay-laurel (*Umbellularia californica*) (Kalcounis-Rüppell and Millar 2002). We visited the nest at 10:30 on 23 April to count the eggs when the turkey hen was off the nest. A male and female California Quail flushed from the nest as we approached. The nest appeared typical of an early-season turkey nest in this population: it was a shallow depression in the leaf litter at the base of a tree, partially screened by shrubby ground cover. In the nest we found one quail egg situated on top of seven turkey eggs. On 26 April, the nest contained 10 turkey eggs; we found no sign of the quail egg, although we did not shift the turkey eggs to check the bottom of the nest thoroughly. At least eight turkey eggs hatched on 22 May, two undeveloped turkey eggs failed to hatch, and a thorough search of the nest site revealed no trace of the quail egg. This parasitic quail egg was the only one found in about 45 turkey nests examined during the course of the study. California Quail and Mountain Quail (*Oreortyx pictus*) are both common residents at the Hastings Natural History Reservation (Davis et al. 1980); California Quail in particular overlap considerably with turkeys in this location (pers. obs.).

We can not entirely rule out the possibility that the quail egg may have hatched. However, it seems unlikely that it could have been properly incubated. Turkey eggs are almost twice the width of quail eggs (Bent 1932), suggesting that once the eggs were turned, the much smaller quail egg might have fallen below the turkey eggs and would not have properly contacted the brood patch of the turkey hen. We do not know the cause of the disappearance of the quail egg, but we hypothesize that it was destroyed by the incubating turkey hen or was the victim of a nest predator that could not consume the much larger turkey eggs.

Although egg dumping by California Quail in Wild Turkey nests has not been reported previously, this behavior is not entirely unexpected. California Quail are reported to practice intraspecific nest parasitism (i.e., "dump nests," Glading 1938), and even lay eggs indiscriminately on the ground while searching for nest sites (Tyler 1913). Their eggs have also been found in the nests of the Mountain Quail (Grinnell et al. 1918), Spotted Towhee (*Pipilo maculatus*, Bleitz 1956), and White-crowned Sparrow (*Zonotrichia leucophrys*, Bent 1932). Turkey nests are vulnerable to conspecific egg dumping (Bailey and Rinell 1967, Krakauer unpubl. data) and have also been parasitized by Ring-necked Pheasants (*Phasianus colchicus*, Schmutz 1988). Modern interactions between turkeys and quail in California began within the past 125 years and are the result of an intensive management program aimed at

establishing the Wild Turkey throughout the state (Wunz 1992). Historically, however, this observation may not represent a novel interaction, since fossil evidence suggests that California Quail may have been sympatric with a species of turkey in the late Pleistocene (Miller and DeMay 1942). Future studies, especially those involving radio-tracking and nest-monitoring, may uncover additional instances of this interspecific nest parasitism.

Many thanks to J. Leyhe and C. Miller for field assistance, and J. Bland, E. DuVal, M. Hauber, W. Koenig, and S. Rothstein for comments on this manuscript. This study was funded by the National Science Foundation (IBN-0104967), the Department of Integrative Biology and Museum of Vertebrate Zoology of University of California, Berkeley, the Animal Behavior Society, and the American Ornithologists Union.

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Accepted 5 November 2003

RUDDY GROUND-DOVE BREEDING IN CALIFORNIA

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On 8 December 2002 I found a female Ruddy Ground-Dove (*Columbina talpacoti*) in a farm yard at the intersection of Eddins and Sperry roads 2.5 km west of Calipatria, Imperial Co., California, 33° 07.5'N, 115° 32.5'W. The farm yards at this location support planted palms, eucalyptus, other shade trees, planted shrubs including native palo verde (*Cercidium floridum*) and mesquite (*Prosopis*), and are surrounded by open fields with irrigation ditches, typical of broad areas of the Imperial Valley (Patten et al. 2003). Grain for livestock in half a dozen small pens provided an abundance of food for doves. Common Ground-Doves (*Columbina passerina*) were numerous, as were Inca Doves (*Columbina inca*), with both species resident and presumably nesting. Subsequently, I saw up to six Ruddy Ground-Doves at this location during January and February 2003, and I suspected a pair still present in May was nesting. On 31 May 2003, Peter A. Ginsburg and I saw what appeared to be two recently fledged young perched side by side on a branch about 5 m off the ground in a bottlebrush (*Callistemon*) tree at this location. These two were a little smaller than the adult male perched nearby and appeared to have some wispy down on their crowns. As we were studying the two young, the adult female flew into the tree and landed, at which time both of the young became very excited and fluttered toward her. Unfortunately, all four birds then flew from the tree, and we were unable to witness any feeding of the young by the adults. Kenneth Z. Kurland was able to photograph the two young the following day (Figure 1), and Ruddy Ground-Doves were still present at this location at least through September 2003.

The west Mexican population of the Ruddy Ground-Dove (*C. t. eluta*) has evidently expanded its range northward in recent years. In northwestern Mexico, Ruddy Ground-Doves first appeared in Sonora in the early 1980s (Russell and Monson 1998), but the species went unrecorded on the Baja California peninsula until 1990 (Erickson *et al.* 2001). The first to be recorded in the southwestern United States were two in southwestern Phoenix, Arizona, 21 October 1981, and nearly 100 individuals had been reported in that state by 1996 (Rosenberg and Witzeman 1998). A male at China Ranch, Inyo County, 31 August–29 September 1984 (Pyle and McCaskie 1992) provided the first endorsed record for California, and more than 100 individuals have been reported in the state as of this date. Records for California extend north to Deep Springs in northern Inyo County (Heindel and Garrett 1995) and west to Goleta on the coast of Santa Barbara County (Patten et al. 1995). Most of these records are for the fall and winter, including the one previous record for the Imperial Valley (Patten et al. 2003), with relatively few in summer. The first to be recorded in New Mexico was photographed in southern Dona Ana County 25 October–2 November 1984, with 30 individuals recorded since that time, most in the last five years (S. O. Williams, III, pers. comm.). The first in western Texas were two at Rio Grande Village in Big Bend National Park 5 December 1987–early May 1988, but the species remains rare there, with only five records since that time (M. Lockwood pers. comm.). Farther to the north, one at Beaver Dam Wash 30 October–2 November 1991 was the first in Utah (Am. Birds 46:128), and one in the Amaragosa Valley 25 September 1990 was the first in Nevada (Am. Birds 45:133).

A pair of Ruddy Ground-Doves with fledglings at the Hassayampa River Preserve in Wickenburg, Arizona, 15–19 May 1993 (Rosenberg and Witzeman 1998) provided the first evidence of nesting in the United States. A "full-tailed juvenile" in the New Mexico portion of Guadalupe Canyon in May 2001 (D. Zimmerman pers. comm.) does not prove local nesting but is strongly suggestive. The pair with two recently fledged young near Calipatria in 2003 provides the first evidence of nesting in California and apparently only the second or third such evidence of nesting in the

United States. Because of the increase in the number of Ruddy Ground-Doves moving north into the Southwest, however, the establishment of this species as a permanent resident can be anticipated.

I thank John F. Baretta for granting me access to his property to monitor the Ruddy Ground-Doves, and I thank Kimball L. Garrett and Kathy C. Molina for suggestions that greatly improved the text.

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Accepted 3 October 2003

Figure 1. Two juvenile Ruddy Ground-Doves (*Columbina talpacoti*) near Calipatria, Imperial Co., 1 June 2003.

Photo by Kenneth Z. Kurland

EXTENSION OF THE NORTHERNMOST BREEDING RANGE OF THE WHITE-COLLARED SWIFT IN WESTERN MEXICO

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The White-collared Swift (*Streptoprogne zonaris*) ranges from Argentina and Bolivia in the south to the West Indies and Mexico in the north (Howell and Webb 1995, American Ornithologist's Union 1998). Howell and Webb (1995) described the species as being an uncommon nonbreeding transient, vagrant, or winter visitor in the west-central part of Mexico and suggested that birds from Jalisco and Colima might belong to the subspecies *albicincta* from southern Central America. Edwards (1972) reported the swift without details from Nayarit, and a few northerly vagrants have been reported in the United States (Hardy and Clench 1982, Lasley 1984, Erickson et al. 1989, American Ornithologists' Union 1998). The northernmost breeding population in western Mexico is reported for the state of Guerrero (Rowley and Orr 1962, Howell and Webb 1995).

On 5 June 2000, we searched for swift nests in a small cave (6 m wide, 4 m high, 3 m deep) behind a waterfall on Las Joyas stream, at Las Joyas Research Station (19° 36′ N, 104° 17′ W) at an altitude of 1600 m, in the Sierra de Manantlán Biosphere Reserve in the municipality of Autlán, Jalisco, Mexico. Aragón Cruz had seen up to eight unidentified swifts emerge from this cave on multiple occasions over several years as far back as 1989, and we suspected that these were possibly White-fronted Swifts (*Cypseloides storeri*) because in 1990 a dead individual of that species was found 200 m downstream from the waterfall (Navarro et al. 1993). As we waded in the stream, approaching the cave's entrance, however, an adult swift emerged and we were able to see the white collar on its upper chest and nape and the bird's notched tail. A month earlier, in May 2000, we twice saw noisy flocks of White-collared Swifts flying over Las Joyas Research Station and adjacent areas. Upon reaching the cave we found a nest with two eggs on a horizontal rock ledge 1.5 m above the water and about 2 m behind the cascade. The nest was a shallow round saucer consisting of mud, mosses, and grasses. It was 10 cm above the ledge floor on a rock. A rock perch covered with excrement was located within the crevice 1.5 m across from the nest ledge. The walls, floor, nest, and eggs were wet from the mist produced by the falling water. The nest was photographed and one egg was collected and deposited in the Zoological Collection of the Instituto Manantlán de Ecología y Conservación de la Biodversidad (Universidad de Guadalajara-CUCSUR). The egg (36.2 mm × 23.2 mm, eggshell thickness 16.0 µm) was soiled with mud and excrement. The cleaned egg was dull white all over. We searched the cave and found no other active nests, although eggshell fragments on other ledges within the cave indicated that swifts had nested there in previous years.

The stream flows along an ecotone between a deciduous oak (*Quercus magnoliifolia*) forest on a southwest-facing slope and pine–oak forest dominated by *Pinus douglasiana* and *P. oocarpa* on the opposite slope. Dominant tree species along the stream banks are mostly those associated with cloud forests (e.g., *Fraxinus udehi*, *Alnus jorullensis*, and *Clusia salvinii*). Slopes on either side ranged from 30° to 90°. The 6-m high waterfall had a stream of water approximately 1.5 m wide that fell into a pool 8 m × 14 m in area and approximately 1 m deep. The waterfall and pool were below the riparian forest canopy, but the birds had access to the cave through an opening in the canopy formed by a very large (20 m × 30 m) rock devoid

of vegetation, over which the stream flowed immediately beyond the pool. We searched three additional waterfalls downstream and found no signs of nesting swifts. There are no other waterfalls upstream. When we revisited the nesting cave on 2 July we found one dark gray downy chick in good condition but no additional nests.

The nest and eggs of this species have been described from Mexico, Central America, the West Indies and South America (Rowley and Orr 1962, Whitacre 1989, Stiles and Skutch 1989, Howell and Webb 1995, Raffaele et al. 1998, and references therein). The nest we observed coincides most with the descriptions by Stiles and Skutch (1989) and Whitacre (1989) for nests on rocky substrates. White-collared Swifts had previously been reported for this region only in winter (Howell and Webb 1995). Since the publication of Howell and Webb (1995), however, there have been numerous winter sight records in the area at Barranca Beltrán, Jalisco, where the species may also breed (S. N. G. Howell pers. comm.). Our observations show the species to be a year-round breeding resident, extending its known breeding range by some 400 km northwest of the sites in Guerrero. Although the species is generally considered colonial in its nesting habits, it is apparent from our observation that it can nest successfully in solitary situations. Furthermore, it does not restrict its nesting to large caves—small sheltered caves near waterfalls along narrow mountain streams can provide adequate nesting habitat if an opening in the canopy provides aerial access to the nesting ledges.

We thank Juan Pablo Esparza Carlos and Eduardo Santana Hernández for their help in the field. The manuscript was improved by the useful comments of Steve Howell, David Whitacre, Charles Collins, and Robert A. Hamilton.

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Accepted 20 October 2003

NESTING OF WESTERN GULLS IN BAHÍA DE SANTA MARÍA–LA REFORMA, SINALOA, MEXICO

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The Western Gull breeds on islands along the Pacific coast of North America from southern Washington to southern Baja California but, before the observations we report here, had never been reported breeding in the Gulf of California (American Ornithologists' Union 1998; Everett and Anderson 1994; Howell and Webb 1995; Pierotti and Annett, 1995; Wilbur 1987). Non-breeding individuals, mostly immature, range into the Gulf of California as far north as Puerto Peñasco and as far south as Bahía Guásimas (Russell and Monson 1998). They are frequently found among Yellow-footed Gulls (*Larus livens*).

Isla El Rancho (25° 10′ N, 108° 23′ W) is at the northern end of Bahía de Santa María, a large coastal lagoon in northwestern Sinaloa approximately 115 km northwest of Culiacán. Located in the center of the lagoon's largest inlet, Isla El Rancho is a low-lying and sandy island covering approximately 120 ha. A series of low dunes covers the western part of the island, while an extensive salt pan and tidal flats cover its center and eastern part. A small area is covered by salt marsh (*Salicornia* sp.) and some shrubs of white mangrove (*Laguncularia racemosa*) less than 80 cm tall. Some sand dunes are covered by the herb *Jaumea* sp. and saltgrass (*Distichlis* sp.).

We visited the area on 20 occasions between March 2000 and June 2001 and made additional visits during the breeding seasons of 2002 and 2003. On each visit we recorded all nesting birds on the island, and on some occasions we noted nest contents.

No Western Gulls were observed on El Rancho in 2000. On 17 March 2001 we found four adult Western Gulls on the western side of the island. On 29 March two Western Gulls were courting, and on 7 April we found a nest with two eggs among the dunes. On 4 May we found a second nest, also with two eggs, and six adults, presumed to constitute three pairs. On 22 May the first nest had been abandoned and the eggs were broken. The second nest and a third nest contained three eggs each. On 6 June the second nest contained two chicks and an unhatched egg. On 16 June the third nest contained two chicks, and we found two additional nests with eggs. Finally, on 23 June we found two additional nests (one with two eggs, the other with three). Some of the nests appeared to have been replacement nests, since several of the earlier attempts were flooded by high tides. In all we noted seven nest attempts, but our largest tallies of adults and active nests at any one time were of eight and four, respectively.

On 9 and 16 May 2002 we found three Western Gull nests containing one, two, and three eggs. In addition to the adults, there were some immature individuals, perhaps those fledged in 2001. On 24 and 25 May 2003 only two nests remained active with clutches of two and three eggs.

In all three years the Western Gulls nested within the large Laughing Gull (*Larus atricilla*) colony along the island's western shore. On 22 May 2001 a Western Gull flying close to Laughing Gull nests was attacked vigorously by adults of the latter species, and on 23 June 2001 we witnessed predation of Laughing Gull chicks by Western Gulls. It is likely that Western Gulls prey also on the eggs of Laughing Gulls and on those of the other nesting seabirds of the island.

El Rancho is located not only well outside the known breeding range of the Western Gull but also outside that of the Yellow-footed Gull (A. O. U. 1998, Howell and Webb 1995, Patten 1996). Indeed, the Yellow-footed Gull has not been confirmed to nest in Sinaloa, not even on Farallón de San Ignacio, an island north of Bahía Santa Maria that appears to have good habitat for this species (González-Bernal et al. 2002) and lies at the same latitude as colonies on the western side of the Gulf of California (Carmona et al. 1994, Mellink et al. 2002).

In addition to the Western and Laughing Gulls, the Blue-footed Booby (*Sula nebouxii*), Osprey (*Pandion haliaetus*), Snowy Plover (*Charadrius alexandrinus*), Wilson's Plover (*Charadrius wilsonia*), American Oystercatcher (*Haematopus palliatus*), Heermann's Gull (*Larus heermanni*), Royal Tern (*Sterna maxima*), Gull-billed Tern (*Sterna nilotica*), and Black Skimmer (*Rynchops niger*) also nest in Bahía Santa Maria. Although the area is relatively remote, the waterbird colonies on Isla El Rancho face several conservation problems. These include the removal of eggs for human consumption, use of fledglings as bait in crab traps (Muñoz del Viejo et al. 2000), and the presence of pesticides from the adjacent agricultural regions (Carmona and Danemann 1994).

Cecilia del Rocio Hernández Celis, Miguel Angel Guevara Medina, and José Alfredo Castillo Guerrero assisted during field work. Edén Hernández Sánchez provided boat transportation to the island. Kimball Garrett, Brad Keitt, and Kathy Molina provided important editorial comments. To all of them, our appreciation. Partial funding for field work was provided by NAWCA grant 98210-1-G041.

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Accepted 24 October 2003

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BOOK REVIEW

Birds of Oregon: A General Reference, by David B. Marshall, Matthew G. Hunter, and Alan L. Contreras (eds.). 2003. Oregon State University Press, Corvallis. 768 pages, 104 black-and-white illustrations, numerous maps. Hardback, $65.00. ISBN 0-87071-497-X. Errata at http://home.comcast.net/~matt.hunter/bogrerrata/errata.htm.

This highly anticipated publication (hereafter BOGR) isn't your usual state bird book for a couple of reasons, the first of which can be detected in the subtitle—it is more than just "status and distribution." The second is indicated in the listing of three editors, for not only were there an additional four principal contributors but the actual species accounts were authored by about 100 volunteers, recruited from among the state's birders, biologists, and researchers. Given the total number of contributors, this book probably also stands out as being more eagerly awaited than any other state book.

There's a lot to peruse in these 5.2 pounds and 752 pages, a size befitting the tenth largest state, whose bird list ranks fifth largest in the country. Luckily for us, BOGR is extremely well organized and clearly written. A section "About This Book" after the preface and acknowledgments explains abbreviations, defines terms of abundance and frequency, and describes the layout of the following chapters and the species accounts. The first of these chapters is an interesting essay describing the changes in Oregon's avifauna since 1935, the cut-off date for Gabrielson and Jewett's (1940) seminal treatise on the subject. Chapter 2 describes the habitats found throughout the state, divided into eleven ecoregions (though in the discussion the Snake River Plain and the [unmapped] Central Basin and Range ecoregions are lumped into the Northern Basin and Range ecoregion). The 593 pages of Chapter 3 constitute the heart of any state bird book, the species accounts. These essentially follow AOU (1998) sequence and taxonomy, with perhaps the only exception being that the Black Brant is listed as a separate species. Chapter 4 offers a review of supplemental species not treated in the species accounts (those considered extirpated, not established, unverified, etc.). These chapters are followed by a brief glossary and three appendices. The first appendix is an extensive list of the common and scientific names of plants and animals mentioned in the species accounts, the second is a table of name changes since Gabrielson and Jewett, and the third describes the Oregon Breeding Bird Atlas (OBBA), the Breeding Bird Survey (BBS), and the Christmas Bird Count. The approximately 3600 literature citations in the bibliography add significant scientific value to the work—and these are just the printed and electronic sources. Following the bibliography is a supplemental listing of over 100 names, with qualification and location, of people cited by the authors in personal communications. I expect this unconventional listing may prove useful to researchers. Many of these sources were also authors of the species accounts, and these citations refer you to the interesting author biographies that follow. Finally, the index, solely of birds, is divided into common and scientific names.

The stated objectives of the book (on page ix) are to "(1) document the status and distribution of the state's birds as known at the beginning of the 21st century; (2) set forth what is known of their habitat requirements in terms of food, cover, and space; and (3) stimulate research and continued investigations by showing what is not known." It bears mentioning that this is the third book published with the same leading title, and its success might be measured by comparing it with the others. *Birds of Oregon* by Gabrielson and Jewett (1940) was the first, and a landmark in its time. Then came *Birds of Oregon: Status and Distribution* by Gilligan et al. (1994). Delineating the status and distribution for most species is a relatively straightforward process, and BOGR does an excellent job, not only updating Gabrielson and Jewett but also going into much greater detail than did Gilligan et al. In fulfilling the second

and third objectives, this book goes well beyond its predecessors. Two outstanding improvements are frequent citations and the inclusion of subspecies (see below).

After a short introductory essay, each species account continues with six subtitled sections. The *General Distribution* is usually taken from the AOU (1998), and the number of subspecies found in North America and Oregon is mentioned (following a variety of sources). This section could have benefited from a critical review by experts with greater expertise outside the state of Oregon. Lapses such as incorrect distribution of the Boreal Owl (this species does not occur in Arizona), for example, could have been avoided. *Oregon Distribution* follows, with most accounts being quite detailed. When more than one subspecies occurs the distribution of each is detailed when confirmed by specimens. The sections *Habitat and Diet* and *Seasonal Activity and Behavior* try to refer to what is known in Oregon; when information from Oregon is lacking the lack is pointed out and data from other regions are often given. *Detection* is a very short paragraph (often one sentence) giving tips on how and where to find the species. Concluding is *Population Status and Conservation*, a section frequently, but not always, backed up with BBS statistics, and which should prove useful to managers and conservationists. At the end is the name of the author(s). All accounts are heavily peppered with citations, including many personal communications.

Because the writing ability, time spent researching literature, and personal experience of each author varied, it is perhaps to be expected that the quality of the resulting accounts might also vary. However, since each author was given a strict format to follow, and perhaps because of extensive proofreading, I usually found it difficult to discern that multiple authors were involved. The length of accounts is usually quite consistent. Some are rather extensive, however, perhaps reflecting the interest and knowledge of an author, with the Peregrine Falcon being a noteworthy example. Other authors obviously delved deeper into the literature, as with the Downy Woodpecker. But it is odd that Cassin's Vireo warranted only about 1.5 columns of text, while Hutton's Vireo received twice that, and the Black Swift slightly over 3 columns. I would argue that Cassin's Vireo deserves attention at least equal to that given these two other species, considering that it is migratory and in Oregon manifests a more complex distribution, seasonal occurrence, and habitat preference. The *Population and Conservation* [sic] section contains almost no useful information, a habitat description here is misplaced, and a reference to Smith et al. 1977 should be 1997; furthermore, a statement claiming "no serious conservation problems," while perhaps true, is unsubstantiated.

The large number of citations throughout (averaging around 30 per species, by my tally of a few accounts) shows how much work went into each account. A list of required or recommended references was probably provided to authors, but, if so, they weren't always referred to evenly. For information on diet and nesting some authors referred heavily to the recent *Birds of North America* species accounts, while others chose A. C. Bent's life histories. This difference may have been due to accounts in the former series not having been published, but it would be nice to know when this was the case; a date next to the author's name, indicating when a BOGR account was written, would have been a helpful addition. Elsewhere, some authors referred extensively to published field notes in *Oregon Birds* or *North American Birds* (and its predecessors), others to personal communications, and some to neither. Some accounts could have been better researched. Why, for example, was H. Herlyn's 1999 "Birds of Benton County, Oregon" (until early 2003 at http://osu.orst.edu/pubs/birds/county/bent/index.html) not used in describing the status and seasonality of the Eurasian Wigeon or Hermit Warbler in the central Willamette Valley? In it I found earlier and later dates than in sources that were used. The *Oregon Breeding Bird Atlas*, not referred to at all in some accounts, was randomly referred to as

"OBBA" or "Adamus et al. 2001"; this citation should have been standardized. In general, though, the species accounts are excellent and useful.

One of the highlights of this book, and one that extends to birders and ornithologists well beyond Oregon's borders, is the exhaustive treatment of subspecies. The editors couldn't have found a better consultant than M. Ralph Browning to act as taxonomic editor; there probably isn't anyone alive with more experience of the literature and specimens from the state. Much new information apparently appears here for the first time, and the need for further field and specimen research is hinted at frequently. This aspect of the book provides a much needed update to Gabrielson and Jewett.

Vagrants are one of the aspects of birding that keeps many of us going, and the joy and challenge of finding rarities is a source of much of field ornithology's energy. Unfortunately, BOGR gives vagrants uneven and not always informative treatment. The descriptions of range and habitat are frequently inaccurate: the Mountain Plover mostly does not breed "on the high plateaus of the Rocky Mtns.," but it certainly does breed farther south than Colorado. The Clay-colored Sparrow is not really of "dry brushlands." The Northern Wheatear winters in Africa, not Asia, etc. And though no one was more qualified to write these accounts than Harry Nehls, longtime Oregon Birds Records Committee (OBRC) secretary, the information in them could have been organized a little better. Species with about 12 or fewer records have them listed individually, which may be too much information; birds that are more regular in occurrence are given less precise data. It would have been good simply to list the number of accepted records for each species along with early and late dates. Some accounts, like that for the Tennessee Warbler, are excellent. But others, like that for the Eastern Phoebe, are bewildering—only two records were "submitted to the OBRC," but the account continues to cite the OBRC for an additional three records and *Oregon Birds* for two more, all of which indeed have been reviewed and accepted by the OBRC (H. Nehls, "The Records of the Oregon Bird Records Committee," http://www.oregonbirds.org/or_rarebird_recs.html). Also, whether records were credited to the OBRC or to notes published in other sources seems to have been random. Some editorial rules could have made this a more useful part of the book for what is surely one of its largest audiences.

The choice to include maps from the OBBA was interesting. Maps were included for all but about 70 breeding species, omissions being mainly or entirely those breeding on the outer coast (e.g., the Pelagic Cormorant and Common Murre), of only very limited breeding distribution (e.g., the Black Swift and Pine Grosbeak), or those occurring statewide (e.g., the Great Horned Owl and House Sparrow). In the section "About This Book" readers are duly warned about the interpretation of "possible" versus "probable" levels of breeding indicated on the maps, but these sorts of maps require more rigorous interpretation (and editing) to be of much use to the reader. Unfortunately, it appears that the maps weren't used by many authors in describing breeding distributions. For example, the Ring-billed Gull account, which is otherwise extremely well written, makes no reference to reports of possible breeding in Lincoln and Yamhill counties. Looking at the OBBA reveals not only that these birds were probably nonbreeding wanderers but also that the species was confirmed as a breeding bird on the Columbia River in Clatsop County, not mentioned anywhere in the BOGR account. It turns out that when the maps where printed they were cropped at the state's borders, and the OBBA hexagon containing this site lies almost entirely in Washington, thus this well-known breeding colony (M. Patterson, pers. comm.) is revealed in BOGR as only a few pixels. Additional examples showing a lack of connection between species accounts and maps are the Long-billed Curlew (breeding confirmed in Jefferson County; Willamette Valley records must have been of migrants or vagrants), Long-eared Owl (breeding confirmed in Benton County), Pileated Woodpecker (occurs in the mountains of Klamath and Lake counties), and

Swainson's Thrush (Great Basin records). While the inclusion of some maps may confuse, the Song Sparrow is missing its map, perhaps the only species for which this omission is unfortunate—the detailed discussion of subspecies' ranges fails to describe this species' statewide distribution, and one is left thinking that maybe Song Sparrows don't occur at all in Deschutes or Jefferson counties. Some or all of this confusion could have been avoided by providing copies of the OBBA to authors dealing with breeding species, and maybe having them edit the maps (or even hand-draw accurate ones). In any case, anyone seriously interested in the distribution of Oregon's breeding birds needs to refer to the OBBA in conjunction with this book. There are also gaps in the maps, such as the recent Yamhill County breeding record of Black Phoebe, which can be misleading when one is tempted to look quickly at a map and not wade through the text. I'm left thinking that simply omitting the OBBA maps may have been a better use of space, but edited or newly drawn maps for every species would have been a valuable addition.

Sprinkled here and there throughout the text (averaging about every six pages) are line drawings of birds by Elva Hamerstrom Paulson. These aren't meant to be aids to identification, and, while a few are a little "off" in shape and proportion, they were drawn with a tender, homey quality that results in exactly the desired effect: they break up what would be an otherwise bleak landscape of columns and paragraphs and make leafing through the book a pleasure. The chapter on habitats also has some splendidly drawn scenes illustrating the various ecoregions.

The editing in general seems to have been very thorough, although it didn't take me long to find a few inconsequential typos. These and a few other similar glitches are obviously minor, and the enormous task of arranging the references was executed brilliantly, even when the potential for error was great (such as when different publications with the same name and date were cited in different accounts). The layout was well planned, with text placed in two columns, the accounts in a continuous run, and narrow but sufficient margins—wasting essentially no space. Each page has an informative header, making it impossible to get lost in the book. The binding and paper seem to be of excellent quality.

While I have issues with the treatment of rarities and the use of OBBA maps, these complaints wither under the overall impact of this book. The task of organizing the army of authors and making them productive must have been monumental, and to have massaged this all into a single, useful tome seems an almost impossible task. This is a tremendously valuable and important work, and a must-have for any regional birder, ornithologist, wildlife manager, and policy maker, or anyone simply interested in birds of the western United States.

I thank Paul Lehman for his comments on a draft of this review.

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Richard C. Hoyer

FEATURED PHOTO

DIET AND FEEDING ACTIVITY AT A FLAMMULATED OWL NEST IN IDAHO

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The Flammulated Owl (*Otus flammeolus*) is a small, cavity-nesting species that feeds on a wide variety of nocturnal arthropods (Marshall 1957, Johnson and Russell 1962, Ross 1969). Various studies throughout western North America during the breeding season have found species in the order Lepidoptera (moths and their larvae) and/or Orthoptera (crickets and grasshoppers) to constitute the majority of this owl's diet, with Coleoptera (beetles), Dermaptera (earwigs), Araneae (spiders), Chilopoda (centipedes), and miscellaneous insects making up a smaller percentage (Goggans 1986, Reynolds and Linkhart 1987, Powers et al. 1996). The male Flammulated Owl is the sole provider of food to the nest during incubation and for a good portion of the nestling period, until the female begins to share feeding responsibilities. The rate of food delivery varies in intensity through the nesting period, increasing as the nestlings mature and food demands are higher (Hayward 1986, McCallum et al. 1995).

From June through August 1992, Leon Powers and I monitored the activity of a pair of Flammulated Owls in Eyrie Canyon, located in the Sublett Mountains of Cassia County, south-central Idaho; our work was part of a larger study that investigated the species' nesting biology and food habits from 1991 to 1994 (Powers et al. 1996). The top photo on the back cover shows an adult with orthopteran prey just prior to a delivery at the nest on 7 July 1992; the bottom photo shows an adult delivering a moth directly to the young at the cavity entrance on 28 July 1992. Following are selected details of observations on diet, feeding activity, and behavior of this pair.

On 26 June we discovered the female occupying a nest cavity in a snag of Quaking Aspen (*Populus tremuloides*). Forest vegetation within the study area was predominantly aspen and Douglas Fir (*Pseudotsuga menziesii*). Other vegetation types in the area were mountain shrubs (including Ninebark, *Physocarpus malvaceus*) sagebrush–grass and riparian with scattered forbs. The diameter of the nest tree at breast height was 29 cm, the nest cavity's height was 5.4 m, and the orientation of cavity was 40° (northeast). On the basis of a known fledging date, and using mean incubation and nestling periods of 22 days each (Goggans 1986, Reynolds and Linkhart 1987), we concluded that the nest was in the early stages of incubation when found. We made partial-night observations on 3, 8, 9, 13, 14, 24, and 29 July and all-night surveillances on 23 and 28 July. Visual observations were made by skylighting the nest entrance to record the number of nest visits. The nest successfully fledged two young, which we found approximately 125 m from the nest on 3 August.

During incubation and the early nestling stage the owls began feeding after sundown at approximately the same time each night (mean 2129 hours, $n = 7$), beginning with the female leaving the cavity briefly, followed shortly by the male delivering food items. The last feeding at the nest occurred just before sunrise (mean 0558 hours, $n = 2$). The adult owls made the food exchange to the young either by flying directly to the nest or by perching first on a small branch of an adjacent tree about 2 m away. On several occasions the adult used its bill and talons to subdue larger orthopteran prey, and possibly to remove appendages (see top photo), before flying to the nest. Early in the nestling period, the adults disappeared into the cavity at each food delivery, but a few days before fledging the young were able to peer out of the cavity entrance (see bottom photo), at which time the food exchange was made at the nest entrance. We did not observe delivery of more than a single prey item per visit.

We counted 133 nest visits on 23 July and 81 visits on 28 July, with both adults making food deliveries to the developing young; the previous high count for nest visits in a single night was 121 by McCallum (1995). Such high counts (>100) likely correspond to times when nestling growth rates are highest and may suggest that the young are 9–12 days old (see Figure 3 in Reynolds and Linkhart 1987). Nightly feeding rates were consistent with those reported elsewhere (e.g., Hayward 1986, McCallum 1995), peaking shortly after sunset and then again just before sunrise. On 23 July we recorded 35 food deliveries between 2115 and 2215, an hourly rate higher than reported elsewhere.

To determine prey type, we used a 35-mm camera to photograph the adults before or during a food delivery. Examination of 65 photographs taken during the nestling period (including those on the back cover) permitted us to identify 63% as pertaining to one of three categories: 28 orthopterans, five coleopterans, and eight lepidopterans, including two larvae. Lepidopterans predominated at other nests within the larger study area in prior and subsequent years, but our data help to demonstrate the Flammulated Owl's ability to feed opportunistically, adjusting diet composition to insect availability locally, geographically, and seasonally. In Oregon, Goggans (1986) found that diets shifted from noctuid moths during the summer to orthopterans later, and the high number of orthopterans delivered by owls at our nest site may reflect the increased availability of these insects relatively late in the season. The high number of hourly and nightly visits recorded during the peak of breeding season attests to the amazing ability of these owls to utilize an important food source in a forest ecosystem.

I thank Leon Powers, Brian Linkhart, Robb Hamilton, and Michael Caterino for their review on earlier drafts of the manuscript.

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Vol. 34, No. 4, 2003

Western Specialty:
Canyon Wren

Photo by © Alan Walther of San Jose, California: Canyon Wren (*Catherpes mexicanus*), San Jose, California, April 2000.

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Front cover photo by © Larry Sansone of Los Angeles, California: White-throated Swift (*Aeronautes saxitalis*), Kern River, Tulare County, California, 26 June 2003.

Back cover "Featured Photo" by © Marshall J. Iliff of Costa Mesa, California, Bell's Sparrow (*Amphispiza belli belli*), Vizcaino Peninsula, Baja California Sur, Mexico, 23 September 2002.

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WESTERN BIRDS

Volume 34, Number 4, 2003

ACTIVITY PATTERNS OF WHITE-THROATED SWIFTS IN CALIFORNIA

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ABSTRACT: We investigated the daily and seasonal activity patterns of the White-throated Swift and related these patterns to seasonal changes in day length and variation in environmental conditions. The time of morning exit from the roost fluctuated more with daily variation in the weather than by season, occurring later after sunrise when temperatures were cool, particularly during winter. Exit time was delayed if temperatures rapidly exceeded the optimal range for aerial insect activity shortly after sunrise. Exit times were also delayed by rain. The evening return of White-throated Swifts to their roost fluctuated more predictably with season, although entry times were also influenced by weather. Entry time was delayed when temperatures were cold and occurred earlier when they were warm or hot or during rain. The pattern of group entry varied by season. In winter, evening roost entry was clumped, with large numbers of swifts entering together. In spring, entry was scattered, with smaller groups entering over a longer period. The pattern of morning exit was clumped year round, with most swifts exiting together as a group.

The White-throated Swift (*Aeronautes saxatalis*) is common but surprisingly little studied. Previous observations of its activity patterns or how environmental conditions affect these patterns have been few (Pickwell 1937). Most published accounts involve brief periods of observations and, while descriptive, draw few conclusions.

As widely reported, White-throated Swifts spend the night in communal roosts located in cracks and crevices of rocky cliffs, sea cliffs, rock quarries (Hanna 1909, 1917, Bent 1940, Anderson 1943, Dobkin et al. 1986) or man-made structures such as buildings (Collins and Johnson 1982), freeway overpasses, and bridges (Ryan and Collins 2000). Some individuals use these seasonal roosts as nest sites during the breeding season. Only during the nesting season do White-throated Swifts return to solid surfaces intermittently during the day to feed their young (Ryan and Collins 2000).

Pickwell (1937) found that in winter White-throated Swifts leave their roost site in the morning and forage on the wing, not returning to the roost until late afternoon or early evening. Entry and exit times vary through the

year. Cold weather may affect these behaviors and lead to mortality. Hanna (1917) also noted that cold temperatures delay or prevent the morning exit from the roost.

Detailed studies of the activity patterns of the Chimney Swift (*Chaetura pelagica*) during the nesting season found that the birds exit their roost before sunrise and return after sunset (Michael and Chao 1973, Zammuto and Franks 1981). Roost entry and exit times are associated more closely with sunrise and sunset time than with temperature, wind speed, or cloudiness (Zammuto and Franks 1981). These authors found that morning exit takes place at a wider range of light intensities than does evening entry and that the birds leave the roost significantly later and enter it significantly earlier on colder days. Activity patterns have also been studied in migratory Common Swifts (*Apus apus*) and Alpine Swifts (*Apus melba*) in Europe (Koskimies 1950, Lack and Lack 1952, Lack 1956, Church 1956) and resident Little Swifts (*Apus affinis*) in India (Razack and Naik 1965).

The goal of this study is to document the daily and seasonal activity patterns of the White-throated Swift and to relate these to seasonal changes in day length and variation in environmental conditions. Interpreting the activity patterns of swifts, however, requires an understanding of their primary foraging habitat, the air column. All organisms that occur here are either adapted for flight or are passively swept into the air column by wind and are often referred to as "aerial plankton" (Glick 1939). Swifts forage on the arthropod component of aerial plankton, most of which belongs to the insect orders Diptera (flies), Hemiptera (bugs), Coleoptera (beetles), and Hymenoptera (bees and wasps) or the class Arachnida (spiders) (Glick 1939). Most swifts forage in both the terrestrial zone (0–300 m above ground), where the density of aerial plankton is highest, and the aeroplankton zone (>300 m above ground), where most arthropods are driven passively by air currents (Berland 1935, Glick 1939). Most swifts feed without any apparent selection on all arthropods of adequate size (Koskimies 1950, Collins 1980, Rudalevige et al. 2003).

Swifts appear to spend the majority of their time in the air foraging. Church (1956) went so far as to assume that all time spent away from the roost is spent foraging. Such habits make swifts indicators of events taking place within the air column. The birds' reactions to changes in day length and weather provide insight into the effects of these variables on this assemblage of prey organisms. Swifts react not only to the conditions that limit their ability to fly, such as darkness and adverse weather, they react to a wider variety of conditions that limit their prey. The times at which they exit and enter the roost reflect time spent foraging and, therefore, time when aerial plankton is sufficient to support the swifts' foraging effort. In this study, we use time spent in and away from the roost to investigate how various environmental conditions influence the White-throated Swift's activity.

STUDY AREA AND METHODS

Ryan observed roosts at Santiago Oaks Regional Park (Santiago Oaks) near the city of Villa Park and at Caspers Wilderness Park (Caspers Park) about 13 km northeast of the city of San Juan Capistrano, Orange County,

California, from December 1993 to March 1995. Observations at these two inland sites were augmented by those made by Collins at a coastal site in the city of Rancho Palos Verdes (Palos Verdes), Los Angeles County, from November 1968 to September 1973.

At Santiago Oaks, the roost was in a 1.5-m vertical crack approximately 30 m above the base of a 40-m northeast-facing cliff on "Rattlesnake Ridge." At Caspers Park the flock used two roosts, shifting from one to the other in January 1994. The two sites were on sandstone cliffs about 250 m apart, with the second being on the adjacent Santa Margarita Ranch. The first roost was in a 3-m crack approximately 16 m from the top of a 20-m cliff; the second roost was in a vertical crack 2.5 m long and 18 m from the base of a 20-m cliff. The Palos Verdes roost, in an abandoned rock quarry at the end of Forrestal Road, was in a nearly horizontal crack about 5 m below the top of a west-facing 30-m cliff.

During each month of our study, we visited each site in the morning and evening when swifts exited and entered their nightly roosts. In the evening, we began observations at least two hours before the expected entry time and terminated them 15 minutes after the last swift entered the roost. The following morning, we began observation one hour before the expected exit time and ended 30 minutes to two hours after the last swift exited the roost. We determined when the last swift exited from the previous evening's total count. We combined observations at the two inland sites (Santiago Oaks and Caspers Park) but analyzed these data separately from those from the coastal site (Palos Verdes) because of the time between observation periods and differences in local conditions.

We analyzed the swifts' daily schedule in terms of "mean exit time" for the morning and "mean entry time" for the evening, expressing these times in minutes before or after sunrise or sunset. We recorded the number of swifts entering or exiting by minute (e.g., 23 entered during 16:12, 12 during 16:13, etc.) during each watch. For each morning and evening we generated a mean entry or exit time, then compared this mean to the official Pacific Standard Time of sunrise or sunset. Because of the speed at which these events take place, the numbers of swifts in large groups (>30 individuals) are estimates.

We analyzed mean exit and entry times by month and season, comparing them by four categories of temperature and four of weather. The four temperature categories were cold (<15.5° C), mild (15.5–21° C), warm (21°–27° C), and hot (>27° C). The four weather categories were clear (0–20% cloud cover), partly cloudy (20–80% cloud cover), cloudy (80–100% cloud cover), or rainy. We also investigated the effects of light intensity, measured in foot candles (fc) with a small hand-held light meter pointed toward vegetated hills.

During our observations, we recognized two distinct entry and exit patterns: clumped and scattered. We defined a clumped entry/exit as >3/4 of individuals present entering or exiting the roost within a five-minute period and the event taking less than one hour. We defined a scattered entry/exit as <1/2 of the swifts entering or exiting the roost within any five-minute period and the whole event spanning more than one hour. We

considered events falling between these two categories as intermediate. We limited our analysis of patterns of aggregation to observation periods during which we recorded at least 10 birds.

Coastal southern California has a Mediterranean climate characterized by cool, intermittently rainy winters, cool and overcast springs, and hot, dry summers. Using 30-year precipitation and temperature records (Ryan 1996), we delimited three seasons for our comparisons, winter (October to March), spring (April to June), and summer (July to September).

Using a chi-squared contingency table we tested differences among clumped, scattered, and intermediate entries and exits for significance. The level of rejection was at $P = 0.05$. Statistical analysis of other observations is presented in Ryan (1996).

RESULTS

Seasonal Patterns

At all sites we found seasonal patterns of exit and entry to be parallel. Exits occurred mostly after sunrise: later during winter, earlier during spring, and later during summer (Table 1, Figure 1). The evening return to the roost occurred mostly before sunset: later during winter, earlier during spring and summer (Figures 1 and 2).

Environmental Influences

The influence of temperature on exit time differed by site. At Caspers Park and Santiago Oaks swifts exited earliest when the temperature was mild, slightly later when it was cold or warm, and latest when it was hot (Table 1). At Palos Verdes swifts exited later during cold temperatures, at an intermediate time during mild temperatures, and earlier during warm temperatures. At this site, during our study, the temperature did not reach the hot category (Table 1). We observed later mean entry times during cold temperatures, intermediate under mild temperatures, and earliest during warm and hot temperatures.

The influence of weather on the swifts' exit times was similar at all sites: the birds exited later under rainy conditions, earlier under clear skies, and at intermediate times under cloudy and partly cloudy skies (Table 1). At all sites swifts returned to the roost earliest during rain; there was no clear pattern among the three sites for return under cloudy, partly cloudy, or clear conditions.

White-throated Swifts exited the roost under a wide range of light intensities. They tended to exit at lower light intensities during summer (July 59 fc, August 90 fc, and September 91 fc) and at higher light intensities during winter (October 160 fc, November 286 fc, December 267 fc, and February 250 fc). All of the exits during light intensities of <100 fc took place during cloudy and foggy conditions, which are frequent during spring and summer. These differences coincide with differences in time of day. On average, the swifts exited their roosts at light intensities much higher than those at which they entered.

Table 1 Mean Exit Times of White-throated Swifts from Roosts at Caspers Park, Santiago Oaks, and Palos Verdes[a]

	Caspers Park/Santiago Oaks	Palos Verdes
Month		
January	164.2 ± 0.22 (20)	83.5 ± 1.62 (856)
February	94.4 ± 2.41 (48)	93.5 ± 2.19 (510)
March	148.9 ± 3.35 (118)	52.0 ± 3.46 (212)
April	132.0 ± 6.00 (78)	−4.9 ± 4.24 (14)
May	115.2 ± 4.37 (113)	32.2 ± 6.52 (62)
June	78.0 ± 5.46 (54)	138.2 ± 7.20 (10)
July	93.7 ± 3.74 (97)	111.5 ± 2.69 (99)
August	179.5 ± 1.01 (143)	48.9 ± 2.36 (227)
September	105.9 ± 2.18 (252)	71.2 ± 8.72 (60)
October	105.6 ± 1.33 (181)	136.4 ± 1.56 (422)
November	114.0 ± 1.74 (81)	115.4 ± 0.99 (684)
December	101.2 ± 10.42 (12)	104.5 ± 0.96 (925)
Season[b]		
Winter	119.4 ± 32.1 (460)	100.6 ± 0.73 (3609)
Spring	112.3 ± 51.1 (245)	38.5 ± 6.37 (86)
Summer	124.9 ± 46.5 (492)	68.6 ± 2.46 (385)
Temperature[c]		
Cold	116.1 ± 4.32 (163)	105.8 ± 0.90 (1525)
Mild	106.5 ± 0.97 (755)	86.2 ± 1.37 (1458)
Warm	126.9 ± 7.88 (72)	22.8 ± 1.77 (109)
Hot	169.4 ± 2.47 (163)	N/A
Weather[d]		
Rainy	172.2 ± 2.30 (81)	178.4 ± 3.92 (51)
Cloudy	120.6 ± 3.25 (202)	117.7 ± 2.82 (281)
Partly cloudy	124.0 ± 2.17 (390)	132.9 ± 2.18 (300)
Clear	106.5 ± 1.70 (457)	87.6 ± 0.86 (2527)

[a]Values represent minutes after sunrise (negative if exit was before sunrise) and are expressed as mean ± standard error (number of recorded exits).

[b]Winter, October–March; spring, April–June; summer, July–September.

[c]Cold, <15.0° C; mild, 15.5–21.0° C; warm, 21.5–27.0° C; hot, >27.0° C.

[d]Rainy, any precipitation during observation period; cloudy, >80% cover; partly cloudy, 20–80% cover; clear, <20% cover.

White-throated Swifts entered their roosts during light intensities ranging from 400 to 2.5 fc. Swifts entered at higher mean light intensities in July (114 fc) and August (147 fc), at lower mean light intensities in September (25 fc), October (10 fc), November (77 fc), and December (40 fc).

Group Entry and Exit

The frequency of clumped and scattered exits did not differ significantly by season ($\chi^2 = 4.33$, $P > 0.25$), although most exits were clumped. Entries were clumped during the winter and scattered during the spring. This difference was significant ($\chi^2 = 23.02$, $P < 0.001$).

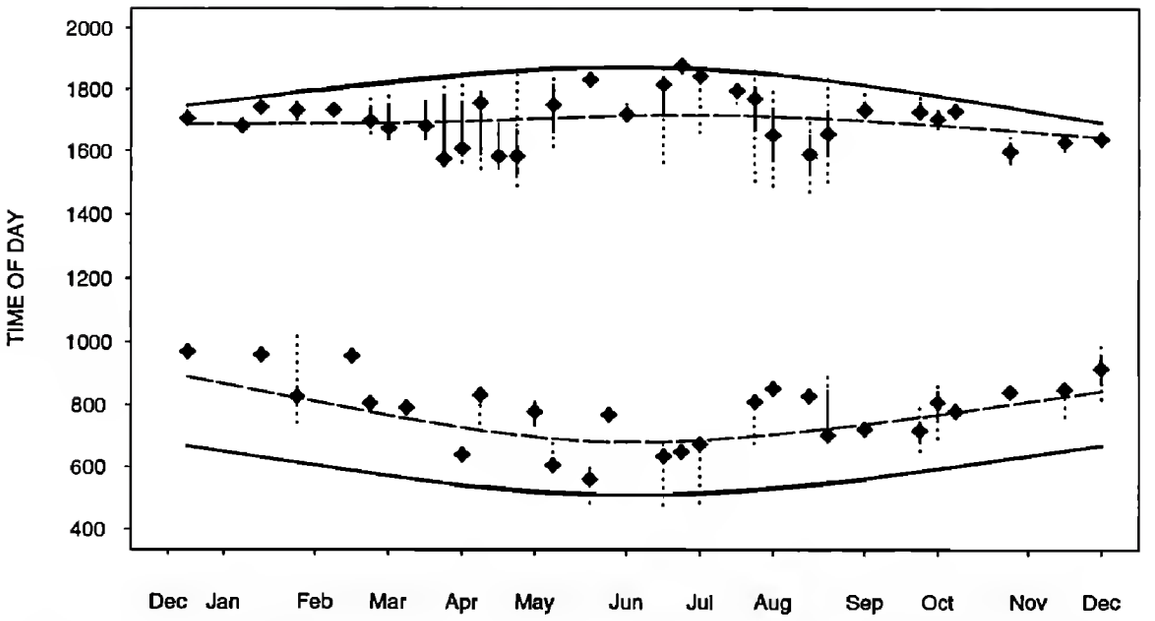

Figure 1. Activity of White-throated Swifts at Caspers Park and Santiago Oaks roosts, 1994–95. Data are represented as weekly averages from winter solstice to winter solstice. Diamonds represent the median times of exit from the roost and entry into it for the week. Solid vertical lines represent the range from the first to third quartile. Dashed vertical lines represent the total range of exits and entries. Dashed horizontal lines represent a fitted curve of the mean entry and exit times. Solid horizontal lines represent times of sunrise and sunset.

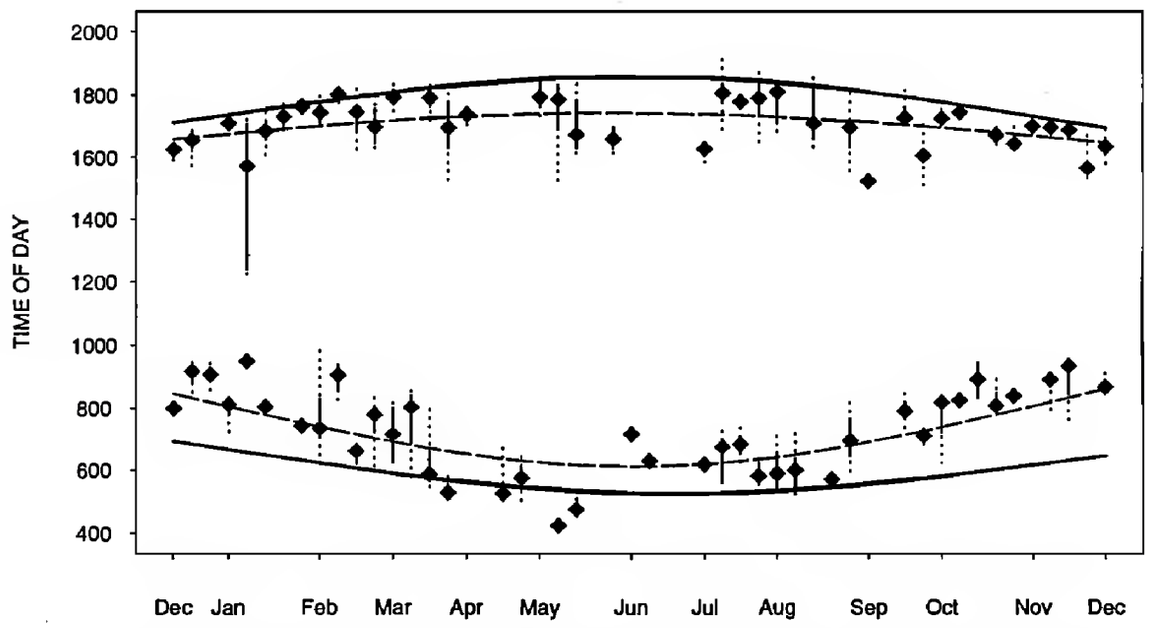

Figure 2. Activity of White-throated Swifts at Palos Verdes roost, 1968–73. Data are represented as weekly averages from winter solstice to winter solstice. Diamonds represent the median times of exit from the roost and entry into it for the week. Solid vertical lines represent the range from the first to third quartile. Dashed vertical lines represent the total range of exits and entries events. Dashed horizontal lines represent a fitted curve of the mean entry and exit times. Solid horizontal lines represent times of sunrise and sunset.

DISCUSSION

Seasonal Patterns

At all seasons most White-throated Swifts exit the roost after sunrise; our only exception was one morning in April at Palos Verdes (Table 1). In India, resident Little Swifts behave similarly, exiting their roost between 1.25 and 3.25 hours after sunrise (Razack and Naik 1965). The Alpine Swift, a migratory species, also exits after sunrise (Arn-Willi 1960). Conversely, the Common Swift, another migrant that spends less time on its breeding grounds, exits the roost well before sunrise in Germany and Finland, with exit times being earlier at higher latitudes where the extended twilight increases light intensity well before the actual sunrise (Scheer 1949). Therefore, the post-sunrise departure among swifts at lower latitudes may be a result of less ambient light prior to sunrise, mild climate, and an extended breeding period. The length of the delay also appears to be influenced by temperature and weather, particularly during the winter.

White-throated Swifts enter the roost close to or after sunset during the winter, before sunset during the spring and summer (Table 2, Figures 1 and 2). Michael and Chao (1973) found entry times of the Chimney Swift, a migratory species, to be most strongly related to sunset time and more directly to light intensity. Weather conditions had some influence with swifts entering later, just before dark, on days less favorable for foraging, earlier on days with wind and rain in the late afternoon. Common Swifts return to the roost substantially after sunset; Alpine Swifts return to the roost close to but slightly before sunset (Arn-Willi 1960). Later entry times at higher latitudes may be a response to the need to maximize foraging time during a shortened breeding season and extended twilight. Without the pressure of a limited breeding season and subsequent migration, White-throated Swifts appear to optimize their foraging time to match times when aerial insects are most abundant in the air column, entering the roost site well before sunset during the breeding season and later, closer to sunset, in the winter (Figures 1 and 2).

While the ultimate cause of these patterns may be fluctuations in prey abundance, temperature, and day length, one difficult question is, "what are the proximate causes?" What are the White-throated Swift's cues to exit from the roost? Prior to exiting, swifts moved from deeper within the roost to nearer the opening, where they often remained for extended periods. This behavior may be an attempt by the swifts to assess conditions outside the roost before exiting. Furthermore, on rainy mornings, and particularly on cold mornings, individuals and small groups exited the roost, briefly circled the area, and then re-entered the roost. We suspect the swifts may be detecting changes in temperature, light, and humidity, by means of visual (rain and clouds) and possibly tactile cues (wet conditions), or some combination of these factors, to determine if conditions outside are suitable for foraging.

Environmental Influences

Variations in the pattern of exit and entry at White-throated Swift roosts also appear attributable to changes in temperature and weather. At Palos Verdes White-throated Swifts exited later during cold and mild temperatures,

Table 2 Mean Entry Times of White-throated Swifts to Roosts at Caspers Park, Santiago Oaks, and Palos Verdes

	Caspers Park/Santiago Oaks	Palos Verdes
Month		
January	1.5 ± 1.86 (32)	6.8 ± 0.55 (880)
February	19.6 ± 0.45 (191)	1.2 ± 0.89 (577)
March	69.7 ± 1.74 (208)	7.3 ± 2.20 (206)
April	101.5 ± 4.33 (169)	54.0 ± 6.39 (54)
May	95.6 ± 7.17 (104)	66.8 ± 6.36 (59)
June	118.0 ± 8.33 (32)	152.5 ± 7.30 (10)
July	52.4 ± 3.71 (79)	89.0 ± 10.60 (73)
August	71.0 ± 3.73 (155)	58.5 ± 2.13 (303)
September	44.0 ± 2.79 (552)	55.3 ± 3.75 (293)
October	−6.6 ± 0.84 (171)	8.9 ± 3.68 (209)
November	46.1 ± 1.78 (120)	3.3 ± 0.70 (633)
December	5.1 ± 1.39 (140)	26.6 ± 0.70 (1496)
Season		
Winter	27.2 ± 1.14 (862)	12.9 ± 0.44 (4031)
Spring	101.3 ± 3.54 (305)	68.1 ± 4.78 (123)
Summer	50.2 ± 2.15 (786)	60.4 ± 2.26 (669)
Temperature		
Cold	17.7 ± 2.73 (175)	14.6 ± 0.77 (2263)
Mild	25.1 ± 0.91 (817)	26.4 ± 0.86 (1640)
Warm	88.4 ± 2.63 (437)	41.6 ± 1.78 (290)
Hot	47.9 ± 2.94 (474)	100.1 ± 1.24 (37)
Weather		
Rainy	128.0 ± 5.06 (105)	406.6 ± 0.69 (106)
Cloudy	8.1 ± 2.20 (189)	32.0 ± 2.50 (379)
Partly cloudy	12.2 ± 1.85 (311)	18.1 ± 2.00 (471)
Clear	50.3 ± 1.40 (1519)	20.2 ± 0.52 (4164)

[a]Values represent minutes before sunset (negative if exit was after sunset) and are expressed as mean ± standard error (number of recorded entries).

[b]Winter, October–March; spring, April–June; summer, July–September.

[c]Cold, <15.0° C; mild, 15.5–21.0° C; warm, 21.5–27.0° C; hot, >27.0° C.

[d]Rainy, any precipitation during observation period; cloudy, >80% cover; partly cloudy, 20–80% cover; clear, <20% cover.

earlier during warm temperatures, with no observations at temperatures above 27° C. At Caspers Park and Santiago Oaks, they exited later under cold, warm, and hot conditions and earlier under mild conditions (Table 1). Most observations at Palos Verdes (88%) were during winter. When we restricted analysis of observations at Caspers Park and Santiago Oaks to winter alone, we found the pattern at all sites to be similar, of swifts exiting later in cold temperatures. The Common, Little, and Chimney Swifts also exit later at lower temperatures (Koskimies 1950, Razack and Naik 1965, Zammuto and Franks 1981).

White-throated Swifts can go into torpor during periods of cold temperatures (Bartholomew et al. 1957). Arousal from torpor to normal body

temperature can occur at environmental temperatures as low as 4° C. It is likely that on cold mornings torpid swifts require more time to warm themselves to a body temperature at which they can become normally active (Bartholomew et al. 1957). Thus later exit times are likely due, in part, to a delay caused by recovery from torpor and/or reduced activity by insects at colder temperatures.

Torpor is a plausible explanation of delays following extremely cold nights, but, at the elevations of our study sites, on few winter nights in southern California does the temperature drop below 10° C. Delays on mornings following mild but cool nights may be a learned behavioral reaction to a reduction in prey at these temperatures.

Both low and high temperatures affect the activity level of aerial arthropods (Holm and Edney 1973, Romoser and Stoffolano 1994). Reduced activity results in a reduction in the passive and active recruitment of arthropods into the air column. The optimal temperature range for aerial arthropods at a height of 60 m above the ground is between 22° and 38° C. Glick (1939, 1957) found that abundance of aerial arthropods decreases considerably at temperatures below 18° C and is very low at temperatures below 15.6° C.

If insect activity drops at colder temperatures, swift activity should drop as well. Common Swifts have been observed not to leave the roost until the air temperature was high enough for "normal" numbers of flying arthropods to be available (Koskimies 1950). The temperature at the first outward flight of Common Swifts varies from 13° to 17° C, with a mean of 15° C, corresponding to expected increases in insect availability (Koskimies 1950).

The temperature at ground level influences the activity of arthropods in the air column, although this influence may be delayed. Few insects fly at temperatures under 15° C, so few are available to be wafted aloft (Koskimies 1950). When temperatures are extremely cold or remain cold after sunrise, dispersal of arthropods into the air is delayed. This may be a primary reason that cold temperatures delay morning exit times of White-throated Swifts.

White-throated Swifts entered the roost later during cold temperatures, earlier during mild, warm, and hot conditions (Table 2). Earlier entry under warmer conditions may be a response to high insect abundance throughout the day providing the birds enough food to meet their demand for energy. The stable, predictable conditions of the southern California summer—long, warm days, rare stormy weather, high abundance of aerial arthropods—provide the swifts with ample food and time to forage earlier in the day. Even while nesting, the Barn Swallow (*Hirundo rustica*) requires as few as six hours of foraging to meet both its own needs and those of its nestlings (De la Cueva and Blake 1997).

On extremely hot days, however, fewer prey may be available. Summer afternoons in southern California regularly exceed 30° C from May to early October. Daily temperatures generally peak in early afternoon (12:00–15:00). Temperatures above 30° C have been shown to reduce aerial insect abundance, particularly in the early afternoon when combined with convection (Koskimies 1950). This reduction lowers prey abundance in the late afternoon and early evening. Early entry in summer may be the swifts' response to reduced aerial insect abundance due to high heat later in the day. Additionally, delays in exiting nocturnal roosts after warm nights

followed by a rapid rise in temperature after sunrise may be a reaction to decreased prey abundance caused by continuous warm temperatures.

At all sites rain also delayed the swifts' morning exit. Other studies have shown that variations in weather affect exit times of swifts similarly. Cloudy weather and rain cause several species of swifts to exit their roost later (Koskimies 1950, Lack and Lack 1952, Razack and Naik 1965, Michael and Chao 1973, Zammuto and Franks 1981). Weather affects arthropod abundance in the air column (Glick 1939), sometimes immediately: raindrops knock arthropods out of the air (Koskimies 1950). However, insect abundance drops during long dry spells and increases immediately following rain (Glick 1939). The immediate effect of rain on the White-throated Swift is a drop in prey abundance during the rain and delayed exit times on rainy mornings.

White-throated Swifts return to the roost earlier during rain (Table 2). We observed swifts entering roost sites early in the afternoon, immediately before or close to the beginning of rain showers. We did not observe swifts outside the roost during heavy rain. Adverse conditions such as fog and rain elicits an early return to the roost in several species of swift (Lack and Lack 1952, Church 1956, Razack and Naik 1965, Zammuto and Franks 1981). Common and Chimney Swifts return to the roost immediately before and shortly after the start of rainstorms (Lack and Lack 1952, Zammuto and Franks 1981). Common Swifts dodge local patches of rain (Lack and Lack 1952). This avoidance behavior may account for Church's (1956) seemingly contradictory statement that weather has no effect on the Common Swift.

Light Intensity

Church (1956) attributed the Common Swift's exit times to changes in light intensity alone. We, however, found White-throated Swifts exiting at a wide range of light intensities, which tended to be lower during the summer and higher during the winter.

Roosting time is correlated with sunlight intensity in several species of swifts (Koskimies 1950, Razack and Naik 1965, Michael and Chao 1973, Zammuto and Franks 1981). However, sunlight intensity at the time of the return to the roost varies with the weather. Chimney Swifts enter the roost at higher light intensities during colder months (Michael and Chao 1973).

In southern California, White-throated Swifts vary greatly in the timing of their return to the roost in relation to light intensity and sunset. They enter at higher light intensities during the early summer, at lower light intensities during the later summer and winter. The Chimney Swift differs, entering at lower light intensity in warmer months, at higher light intensity during colder months (Michael and Chao 1973). From this, it seems that temperature and its influence on prey abundance is more of an influence on swift activity than light intensity by itself. Light intensity, however, does set ultimate limits to swift flight and foraging and is often correlated with the influences of temperature on these activities.

Patterns of Group Entry and Exit

The evening return to the roost is an impressive spectacle described for several species of swifts (Lack and Lack 1952, Church 1956, Razack and

Naik 1965, Michael and Chao 1973). Entries have been characterized as large, dramatic events with large numbers of swifts pouring into a roost within a few minutes (Linton 1924, Pickwell 1937, Church 1956, Razack and Naik 1965, Michael and Chao 1973); such "clumped" entries are typical in winter. During spring, however, the White-throated Swift has a more "scattered" pattern of entering and exiting in smaller groups over a more extended period.

At all three roost sites we studied White-throated Swifts were most numerous during winter. The swifts gathered close to the roost for an hour or more before entering, frequently in one large flock. Often, the flock formed screaming parties that circled close to the opening of the roost site, vocalizing loudly. They then scattered into the air above the roost, possibly to feed, between successive close approaches. They often repeated this behavior several times. As sunset approached, the swifts slowly increased elevation, spiraling upward until they were almost out of sight. In so doing, they remained in sunlight even after the sun had dropped below the horizon at ground level. This may have been an attempt to stay warm long as possible before roosting, as Tomback (1978) reported for Clark's Nutcracker (*Nucifraga columbiana*). Eventually, an individual dived toward the roost and others followed, with the majority of the group entering the roost within minutes. We observed as many as 140 swifts entering their roost within one minute. Frequently, one to five stragglers remained outside the roost for several more minutes before entering.

Roost entries were more scattered during the spring. Small groups converged on the roost site, often circling it repeatedly. They entered the roost in even smaller groups, spaced widely apart. Rarely were the numbers entering uniform; groups of two to six individuals were most common, but the size of flocks entering roosts in spring still ranged up to 60. During these months, the populations at Caspers Park and Santiago Oaks were generally lower; and the weather tended to be milder.

Summer entries were scattered, clumped, or intermediate in no distinct pattern. Contributing to this variation was the smaller number of swifts using the roosts, which resulted in the deletion of several observations from the analysis (see Study Area and Methods).

We were also unable to detect a distinct pattern in exits at all seasons. Exits tended to be clumped. The exit of the main group usually took longer than the entry, with 25–35 individuals exiting per minute; a maximum of 63 individuals exited in one minute at Caspers Park.

CONCLUSIONS

In summary, the roosting behavior of the White-throated Swift varies seasonally in numbers of individuals (Ryan and Collins 2003a), entrance and exit patterns, and sociality (Ryan and Collins 2003b). Although entrance and exit times show some linkage to ambient light conditions, the related variables of temperature and weather and, in turn, their effect on the swift's aerial food supply, seem to be the stronger predictors of roosting behavior. Parallel studies of swifts elsewhere under different environmental regimes

may provide additional clues as to the most important variables influencing their behavior.

ACKNOWLEDGMENTS

We thank Ruth Adermann, Kristen Ballay, Kathleen Gazzaniga, Amy Gorosope, Estela Hinojos, Susan Hoffman, Rodd Kelsey, Karen Mabb, Rebecca Marr, Amy O'Shea, R. Darrel Sager, Robert Schallman, and Michael Taylor for their assistance in the field, Donna Krucki, for originally locating the roost site at Caspers Park, David Bradley and David Voelker for their assistance with the figures, Stuart Warter, for his helpful comments on field methods and analysis, and Dan Cooper, Michael Patten, and Kathy Molina for their helpful reviews of this paper.

We also thank Orange County Parks and the Santa Margarita Ranch Company for permission to study on their land, the staffs at Caspers Wilderness Park and Santiago Oaks Regional Park for their enthusiastic assistance, H. T. Harvey & Associates for support and use of their facilities, and California State University, Long Beach, and the Pomona Valley Audubon Society for their financial support of this project.

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Accepted 15 February 2004

SEASONAL POPULATION FLUCTUATION OF WHITE-THROATED SWIFTS AT ROOST SITES IN SOUTHERN CALIFORNIA

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ABSTRACT: In southern California, White-throated Swift (*Aeronautes saxatalis*) roosts contain many more individuals during the winter months than during the breeding season. Dates of the high and low counts at these roosts fluctuate from site to site and from year to year. Evidence suggests that some individuals remain and nest at or near the roost; whether others migrate north to breeding areas remains unknown.

The White-throated Swift (*Aeronautes saxatalis*) is widespread in much of western North America, where its bold patterning, loud vocalizations, and aerial habits make it easily detected and identified. It occurs year round in southern California as well as from central California, central Arizona, southern New Mexico, and southwestern Texas south to Oaxaca, Mexico (AOU 1998). It is a breeding summer resident only northward along the Pacific coast to northern California and inland to eastern Oregon, southern interior British Columbia, and southern Alberta (AOU 1998, Ryan and Collins 2000). Little detailed information about White-throated Swift migration (Hughes 1998, Ryan and Collins 2000) is available. The species is absent from the more northerly parts of its range for many months, in British Columbia, for example, from mid August to early April (Campbell et al. 1990, Goward et al. 1995).

Grinnell and Miller (1944) and Small (1994) suggested that in California the White-throated Swift is more common and widespread in summer. Garrett and Dunn (1981) stated that in southern California, "this species appears more irregularly and in lesser numbers in most areas in winter, although large concentrations may still be found in some coastal and desert areas."

White-throated Swifts nest and roost in narrow horizontal or vertical cracks and crevices in rocky cliffs (including sea cliffs) and rock quarries (Hanna 1909, 1917, Bent 1940, Anderson 1943). They also adopt man-made structures such as buildings (Yocum 1966, Collins and Johnson 1982), freeway overpasses, and bridges (Ryan and Collins 2000). Little is known, however, about their specific requirements for roost sites or nest sites.

In this study we examine seasonal fluctuations in the populations of White-throated Swifts at roost sites in southern California by describing the attendance of swifts at three year-round roosts and making comparisons between breeding and winter periods.

STUDY AREA AND METHODS

As part of a broader study of swift behavior from late February 1994 to March 1995 (Ryan 1996), Ryan studied swifts at two locations in Orange

County: Santiago Oaks Regional Park and Caspers Wilderness Park from December 1993 to March 1995 (Ryan 1996). Observations at these two inland sites were augmented by those made by Collins at a coastal site in the city of Rancho Palos Verdes (Palos Verdes), Los Angeles County, from November 1968 to September 1973. Ryan and Collins (2003, this issue) detail the study sites and data collection further.

During each month of our study, we visited each site in the morning and evening when swifts exited and entered their nightly roosts. In the evening, we began observations at least two hours before the expected entry time, and terminated them 15 minutes after the last swift entered the roost. The following morning, we began observation one hour before the expected exit time and ended 30 minutes to two hours after the last swift exited the roost. We determined when the last swift exited using the previous evening's total count. Data presented are the mean population counts at each roost in each month. We grouped our monthly mean roost counts into two seasons, winter and breeding. Winter counts were made between 1 November and 15 March, breeding-season counts between 1 April and 1 August. We used a Mann–Whitney *U* test to compare counts by season for each site and present the standard error of the mean (SEM) as a measure of variability.

RESULTS

At all three sites the populations of White-throated Swifts fluctuated in a similar manner, although the exact timing of the fluctuations differed from roost to roost (Table 1). These roosts hosted the most swifts during the fall and winter, decreased throughout the spring, and reached their lowest numbers in summer. At Palos Verdes the population peaked from November to January, at Caspers Park from August to February, and at Santiago Oaks

Table 1 Mean Numbers of White-throated Swifts Roosting at Santiago Oaks and Caspers Park, 1993–95, and at Palos Verdes, 1968–72[a]

Month	Santiago Oaks	Caspers Park	Palos Verdes
January	7 (1)[b]	No data	122.4 ± 19.3 (8)
February	40.0 ± 0.0 (2)	147 (1)[b]	76.6 ± 15.1 (7)
March	46.3 ± 3.6 (9)	No data	55.0 ± 8.5 (3)
April	28.2 ± 2.7 (6)	30 (1)[b]	13.8 ± 1.5 (4)
May	22 (1)[b]	17 (1)[b]	13.5 ± 1.9 (4)
June	8.3 ± 2.0 (3)	19.0 ± 2.0 (2)	10 (1)[b]
July	2.3 ± 0.3 (3)	29.5 ± 0.5 (2)	34.0 ± 2.7 (3)
August	4.5 ± 1.6 (4)	129.0 ± 0.0 (2)	94.5 ± 20.2 (4)
September	5 (1)[b]	189.0 ± 33.4 (3)	89.7 ± 13.4 (3)
October	13.5 ± 0.5 (4)	144.0 ± 0.0 (2)	104.5 ± 67.5(2)
November	37.0 ± 3.1 (5)	No data	150.5 ± 19.1 (4)
December	31.5 ± 18.5 (2)	120 (1)[b]	131.5 ± 18.3 (10)

[a]Data presented are means ± standard errors. The number of counts is given in parentheses.

[b]When only one count was made the number represents a count, not a mean.

from November to March. Populations reached their lowest levels at Palos Verdes from April to July, at Caspers Park from May to June, and at Santiago Oaks from June to September.

We analyzed the results statistically comparing numbers in winter to numbers in the breeding season. At Santiago Oaks the wintering population averaged 36.1 ± 3.4 individuals while the breeding-season population averaged 19.5 ± 2.5 individuals ($t = 3.92$, df = 30, $P = 0.0005$). At Palos Verdes the wintering population averaged 112.8 ± 6.9 individuals while the breeding season population averaged 21.6 ± 3.8 individuals ($t = 11.6$, df = 83, $P < 0.0001$). We were unable to analyze variation at Caspers Park in the same way because we lacked sufficient winter observations there; the trend, however, was similar, with an average of 79.3 ± 27.9 ($n = 4$) individuals in winter and 30.3 ± 4.9 ($n = 8$) individuals during the breeding season.

DISCUSSION

These data demonstrate that in southern California roosts of the White-throated Swift host more birds during winter than during the breeding season. There is some variation in the timing of peak high and low numbers at different sites and in different years. Congregating in large winter roosts may be due to a preference for some traditional roost sites situated in advantageous locations perhaps providing a milder microclimate, increased exposure to solar radiation, and/or close proximity to good foraging. Additionally, many bodies in a small confined space may improve an individual's ability to maintain warmth and survive the colder winter weather (Bartholomew et al. 1957, Pickwell 1937). Because in winter these swifts congregate in higher numbers in fewer roosts, disturbance or destruction of winter roosts could affect more individuals and be more damaging to the species than disturbance or destruction of the more widely spaced nesting sites.

In spring, White-throated Swifts disperse from these large winter communal roosts. Throughout their range they nest semicolonially, mostly in groups of two to eight pairs (Ryan and Collins 2000). As temperatures increase, much of the dispersal leading up to the breeding season may be local, as the constraint of maintaining body temperature during periods of limited prey availability lessens. Observations at Palos Verdes of pairs of swifts nesting in smaller openings elsewhere on the same cliff face as the winter roost support this possibility. Furthermore, observations elsewhere in California suggest that the birds reoccupy nesting sites in March and April.

Some component of southern California's wintering population, however, may migrate north. As yet there are no recoveries of banded birds to support this, although to date few White-throated Swifts have been banded (171 individuals) and even fewer have been recaptured. All recaptures have been at or near the location where the bird was banded (Collins 1971, 1973, unpubl.). Greater effort in banding and recapturing these swifts would help differentiate between local dispersal and migration. Small radio transmitters for tracking movements and an examination of the ratios of stable hydrogen isotopes in feathers could also be employed in such a study (Chamberlain et al. 1997, Hobson and Wassenaar 1997).

ACKNOWLEDGMENTS

We thank Ruth Adermann, Kristen Ballay, Kathleen Gazzaniga, Amy Grosope, Estela Hinojos, Susan Hoffman, Rodd Kelsey, Karen Mabb, Rebecca Marr, Amy O'Shea, R. Darrel Sager, Robert Schallman, and Michael Taylor for their assistance in the field, Donna Krucki for originally locating the roost site at Caspers Park, and Stuart Warter, Dan Cooper, Kimball Garrett, and Kathy Molina for their helpful reviews of the manuscript. We also thank Orange County Parks and the Santa Margarita Ranch Company for permission to study on their lands, the staffs at Caspers Wilderness Park and Santiago Oaks Regional Park for their enthusiastic assistance, and California State University, Long Beach, and the Pomona Valley Audubon Society for financial support of this project.

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Accepted 5 February 2004

White-throated Swift

Sketch by George C. West

SOCIAL BEHAVIOR OF WHITE-THROATED SWIFTS

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ABSTRACT: The social behavior of the White-throated Swift includes Chases Without Contact, Chases With Contact, and Courtship Falls. These behaviors have a strong seasonal pattern. Chases Without Contact were the most common interaction and occurred most frequently during the winter and spring. Chases With Contact and Courtship Falls occurred less frequently and peaked during spring prior to breeding. White-throated Swifts also have social behaviors that may be termed the Raised-Wing display, Screaming Party, and Silent Dread.

The White-throated Swift (*Aeronautes saxatalis*) is widespread and common in western North America. Despite this, remarkably few details are known about its intraspecific behavioral interactions, even though it is a highly social species. In winter, nocturnal roosts may contain up to 500 individuals (Hanna 1909, Hanna 1917, Bent 1940, Ryan and Collins 2000). By day, White-throated Swifts usually forage in groups, often far from the roost, and occasionally with other species (Ryan and Collins 2000).

The extreme mobility and extensive daily foraging range of most swifts, including the White-throated, have hampered detailed studies of their behavior. Social displays of the White-throated Swift include subtle, difficult-to-observe glides on raised wings as well as the more obvious rapid noisy chases. During the spring courtship period, these swifts engage in dramatic Courtship Falls in which members of a pair cling together in mid air and fall, whirling and tumbling, sometimes for several hundred feet (Michael 1926, Bent 1940). As described by Dawson (1923), "the birds come together from opposite directions, engage with the axes of their bodies held at a decided angle laterally, and begin to tumble slowly downward, turning over and over the while for several seconds, or until earth impends, whereupon they separate without further ado." Some researchers suggest mating takes place during this fall, an assertion supported by the collection of only male–female pairs engaging in these falls (Bradbury 1918). However, the birds have also been reported to mate in the nest crevice (Bent 1940).

Because the scarcity of information about the social interactions of swifts is, in part, due to the difficulty in observing them for extended periods, the gathering of flocks near roost sites provides a unique opportunity to gain insight into the social interactions of these birds. The goal of this study was to document and describe the social behavior of White-throated Swifts at three roost sites in southern California and determine the seasonal patterns of the most commonly observed interactions.

STUDY AREA AND METHODS

As part of a broader study of swift behavior from late February 1994 to March 1995 (Ryan 1996), Ryan studied swifts at two locations in Orange County: Santiago Oaks Regional Park and Caspers Wilderness Park. Ryan and Collins (2003, this issue) detail the study sites and data collection further.

We focused our observations on three types of interactive displays: Chases Without Contact, Chases With Contact, and Courtship Falls. We defined Chases Without Contact as interactions in which one bird actively pursued another. Chases Without Contact were often accompanied by vocalizations. The pursued bird often changed flight direction to evade the pursuer's approach. Chases With Contact were recorded when contact was made between two birds involved in a chase. Courtship Falls were recorded when two birds came together and remained attached to one another long enough to begin to fall, losing altitude in a relatively uncontrolled manner, as previously described (Dawson 1923, Bradbury 1918, Michael 1926). We used Kruskall–Wallis tests to compare the frequencies of behaviors by season.

RESULTS

Although Chases Without Contact, the most commonly observed behavior, occurred during all seasons, the frequency of this interaction was significantly higher in winter and spring than in summer ($H = 6.86$, df = 2, $P = 0.03$; Figure 1). Frequencies in winter and spring did not differ from each other ($P = 0.82$; Figure 1). Although Chases With Contact tended to be least frequent during winter (Figure 1), differences by season were not significant ($H = 2.36$, df = 2, $P = 0.31$). Courtship Falls tended to occur

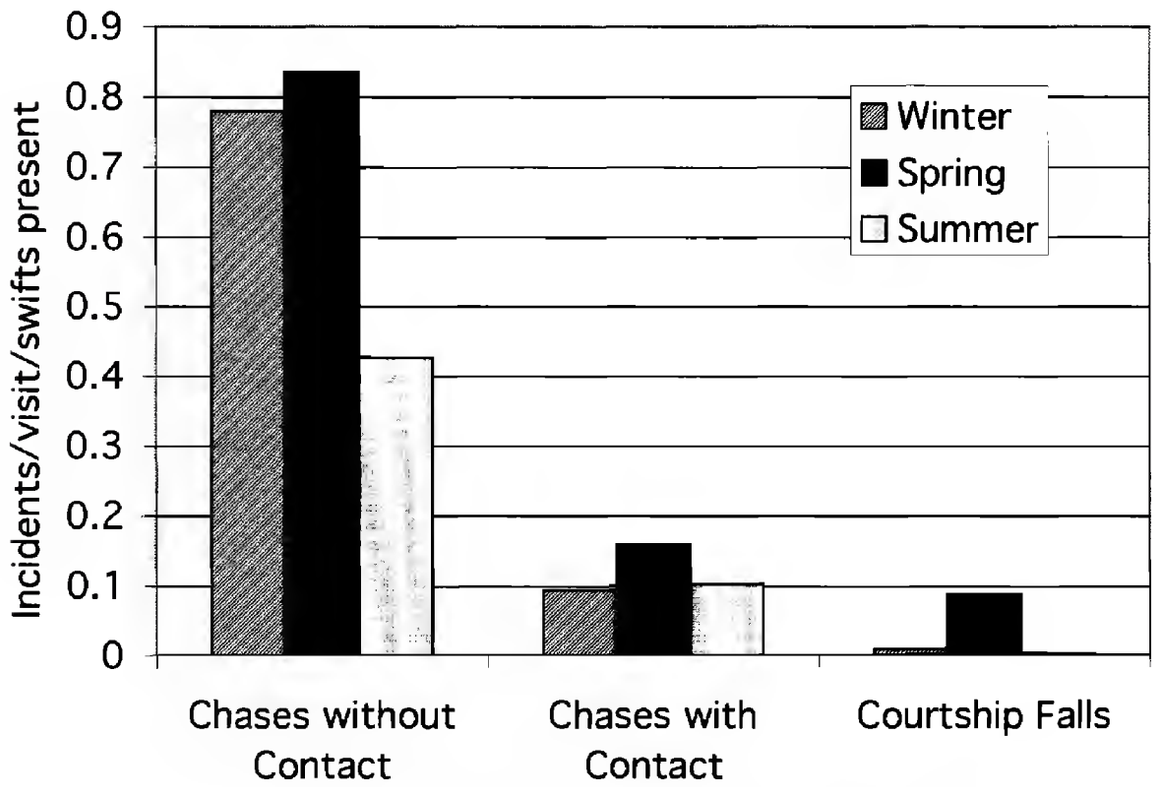

Figure 1. Seasonal patterns of Chases Without Contact, Chases With Contact, and Courtship Falls of White-throated Swifts in southern California. To correct for variation in the numbers of swifts by site and date, the data are presented as the number of incidents of the behavior occurring per observation period (= visit) per bird present.

most frequently during the spring (Figure 1), although this result was only marginally significant ($H = 4.62$, df = 2, $P = 0.10$).

During our observations, we also noted several other behaviors whose seasonal occurrence we did not quantify. In particular, we noted a Raised-Wing or "V" display (Ryan and Collins 2000) performed by two birds in paired flight. The bird in the lead position brought both wings to an angle of <30° above the horizontal plane and held that position briefly (<5 seconds). No side-to-side rocking motion was observed at this time, although the bird giving the display appeared slightly unstable in flight for a brief period. The displaying bird, which was in all cases the lead bird, maintained a straight glide path for the few seconds during which the wings were elevated. During the display, both participants called repeatedly. Courtship Falls frequently followed this display rather than preceded it, as we previously reported erroneously (Ryan and Collins 2000).

White-throated Swifts also engage in two group behaviors involving larger numbers of birds. One of these behaviors is the formation of Screaming Parties as described for the genus *Apus* by Lack (1956). The other behavior we term Silent Dreads. During a Screaming Party, a large group of swifts passes together near the roost or nesting crevices. During the pass many if not all individuals call simultaneously. They often repeat this behavior several times before resuming foraging. At times, some individuals from the flock entered or exited the roost during or immediately following this behavior. A Silent Dread event occurs while the flock is either in the air foraging or during group flights close to the roost site shortly before entering. Prior to a Silent Dread, the swifts actively vocalize in a loose swirling group. During a Silent Dread, the entire group stops calling and silently rushes away from the site. The whole flock departs in an uncoordinated rush, regrouping at a substantial distance from the previous center of activity. This rapid silent departure is consistent with an evasive response to aerial predators, hence the name we apply to it.

DISCUSSION

White-throated Swifts are highly social and can frequently be observed calling and chasing. The social interaction most often observed is the frequent calling that comes from the individuals in flocks. The intensity of these vocalizations increases when individuals engage in chases. Chases generally involve only two individuals, although a third sometimes joins in the pursuit. Subsequently, others may be attracted to the commotion.

The frequency of Chases Without Contact is higher during winter and spring, when roosts contain the largest number of birds (Ryan 1996, Ryan and Collins 2003). During the summer, populations at the roost are reduced and this and other social behaviors decrease. Chases of this type have been recorded for the Black (*Cypseloides niger*) and Vaux's (*Chaetura vauxi*) Swifts (Rathbun in Bent 1940). The peaking of Chases With Contact during spring suggests that this behavior is associated with courtship or an increase in the level of aggression among individuals prior to and during the courtship process.

Courtship Falls peaked in spring, during the time of courtship, mating, and the onset of nesting. This behavior is believed to be, in part, a courtship display, and may involve mating (Bradbury 1918). In the genus *Apus* aerial copulation occurs while both individuals are in a long shallow glide and does not involve interlocked falls (Lack 1956, Cramp 1985). A similar touch-and-grasp behavior in the Black Swift appears to be more of an aggressive interaction (Marin 1997). We have also observed Courtship Falls identical to those of the White-throated Swift in the White-tipped Swift (*Aeronautes montivagus*) in Venezuela.

Raised-Wing displays have been recorded for a variety of species of swifts. They have variously been described as "V-displays" (Ryan and Collins 2000), "V-ing" (Fischer 1958), "Wing-Raising" (Rothganger and Rothganger 1973), and "Wings-High displays" (Lack 1956, Cramp 1985). The behavior is equally varied in form. In the Common Swift (*Apus apus*), it is the lead of two birds in paired flight that gives the display, which seems to be a precopulatory solicitation display given by males (Lack 1956, Cramp 1985, Rothganger and Rothganger 1973). The position of the wings is similar to that of the male during aerial copulation (Rothganger and Rothganger 1973). In the Chimney Swift (*C. pelagica*) it is not the lead but the following bird that initiates the display by suddenly raising "its wings so they form an acute angle with one another" (Fischer 1958); the lead bird may follow suit by raising its wings and continuing with a paired glide, particularly late in the breeding season. In the Chimney Swift, the display seems to be related to physiological synchronization and maintenance of the pair bond; the birds copulate only when perched near the nest site (Fischer 1958). In the Chimney and Vaux's Swifts (Fischer 1958, Bull and Collins 1993) the wings are raised higher (>45° above horizontal) than in either the White-throated or Little Swift (*Apus affinis*; Collins unpubl.), which raise the wings at <30° above the horizontal. Further study is needed before these differences in the form of the display can be safely associated with the different sexual functions that have been suggested.

Screaming Parties have been described for a number of species of swifts, particularly in the genus *Apus* (Lack 1956, Cramp 1985). We have also observed this behavior in *Aeronautes montivagus*. Although Screaming Parties of White-throated Swifts closely approach the roosting and nesting cliffs and stimulate audible vocalizations from swifts remaining within the roost, we never noted the participants in the Screaming Parties to make contact with the surface of the cliff. This differs from the behavior of the Common Swifts in which individuals ("bangers") strike the openings of their nest chambers during similar flight displays (Lack 1956, Cramp 1985).

During Silent Dreads, we occasionally noted a Cooper's Hawk (*Accipiter cooperii*) or Peregrine Falcon (*Falco peregrinus*), or birds that could be mistaken for predators, such as the Turkey Vulture (*Cathartes aura*) or Common Raven (*Corvus corax*), nearby. We never observed this behavior during an overt attack, however, and in most cases, we observed no obvious stimulus for this group behavior. We observed Silent Dreads more frequently near or after sunset, on cloudy, windy days, and particularly during the period of rapid group circling just prior to the swifts' entering the roost. The

decrease in light intensity at this time may have contributed to the seeming false-alarm nature of this response.

The Silent Dread behavior of White-throated Swifts is described here for the first time. It may be present but simply overlooked in other species of swifts, but the dramatic change from a nearby noisy social group to a silent departure from the immediate area makes this unlikely.

ACKNOWLEDGMENTS

We are indebted to Ruth Adermann, Kristen Ballay, Kathleen Gazzaniga, Amy Gorospe, Estela Hinojos, Susan Hoffman, Rodd Kelsey, Karen Mabb, Rebecca Marr, Amy O'Shea, Darrel Sager, Robert Schallman, and Michael Taylor for their assistance in the field and to Donna Krucki, who originally located the roost site at Caspers Park. We also thank Orange County Parks and the Santa Margarita Ranch Company for permission to study on their land and the staffs at Caspers Wilderness Park and Santiago Oaks Regional Park for their enthusiastic assistance. California State University, Long Beach, and the Pomona Valley Audubon Society provided financial support for this project. Stuart Warter and Kathy Molina reviewed earlier drafts of the manuscript.

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Accepted 5 February 2004

DIET OF BREEDING WHITE-THROATED AND BLACK SWIFTS IN SOUTHERN CALIFORNIA

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ABSTRACT: We analyzed the diet of nestling White-throated (*Aeronautes saxatalis*) and Black Swifts (*Cypseloides niger*) in southern California. White-throated Swifts fed their nestlings on boluses of insects more taxonomically diverse, on average (over 50 arthropod families represented), than did Black Swifts (seven arthropod families, primarily ants). In some cases White-throated Swift boluses contained primarily one species, while other boluses showed more variation. In contrast, all Black Swift samples contained high numbers of winged ants with few individuals of other taxa. Our results provide new information on the White-throated Swift's diet and support previous studies of the Black Swift.

Swifts are among the most aerial of birds, spending most of the day on the wing in search of their arthropod prey. Food items include a wide array of insects and some ballooning spiders, all gathered aloft in the air column (Lack and Owen 1955). The food habits of a number of species of swifts have been recorded (Collins 1968, Hespenheide 1975, Lack and Owen 1955, Marín 1999, Tarburton 1986, 1993), but there is still little information available for others, even for some species that are widespread and common. Here we provide data on the prey size and composition of food brought to nestlings of the White-throated (*Aeronautes saxatalis*) and Black (*Cypseloides niger*) Swifts in southern California. The White-throated Swift is a common resident that nests widely in southern California, while the Black Swift is a local summer resident, migrating south in late August (Garrett and Dunn 1981, Foerster and Collins 1990).

METHODS

When feeding young, swifts of the subfamilies Apodinae and Chaeturinae return to the nest with a bolus of food in their mouths (Collins 1998). This bolus is passed to the nestlings. Each bolus, made up of an array of arthropods loosely stuck together with saliva, can contain only a few large items or several hundred small ones (Lack and Owen 1955, Collins unpubl. data). We collected five boluses from adult White-throated Swifts (subfamily Apodinae) returning to nests in a man-made structure in Glendale, Los Angeles County, California. All collections were made between 14:00 and 16:00 on 6 June 1997, 6 and 27 July 1999, and 21 June and 28 July 2000, in conjunction with banding and studies of nestling growth at this site. We collected boluses infrequently in order to minimize disturbance and possible effects on the study of nestling growth (Collins unpubl. data). The dominant land-cover type within 15 km of the nest site is urban with some areas of chaparral, coastal scrub, and montane hardwood forest (Davis et al. 1998).

Black Swifts and other members of the subfamily Cypseloidinae carry a larger mass of food in the esophagus, enabling them to return to provision the nestling at longer intervals, perhaps only once or twice a day (Collins 1998, Marín 1999). While we were banding the swifts, we took four samples of this esophageal food mass on 7 August 2000 from adults returning at dusk to nests at Lawlor Falls, located in the San Jacinto Mountains near Idyllwild, Riverside County, California. Foerster (1987) and Marín (1999) previously studied Black Swifts at this site. The dominant land-cover types within 15 km of this site are chaparral, montane hardwood forest, ponderosa pine (*Pinus ponderosa*), Jeffrey pine (*P. jeffreyi*), urban, coastal scrub, and annual grassland (Davis et al. 1998).

We stored the food samples in 70% ethanol for later analysis. We sorted the samples under a dissecting microscope and, using Borror et al. (1989), identified the prey to order and, when possible, to family. Using an ocular micrometer, we measured the body length of each prey item to the nearest 0.1 mm. Standard deviations are reported along with mean values.

RESULTS AND DISCUSSION

White-throated Swifts fed on a variety of prey with Hemiptera (bugs, hoppers; 41.86 %), Psocoptera (bark lice; 27.24%), and Diptera (flies; 21.94 %) being the dominant orders represented (Table 1). Over 50

Table 1 Arthropod Composition of Five Boluses of White-throated Swift Prey[a]

	Bolus				
Order and Family (or Superfamily)	1	2	3	4	5
Hymenoptera (ants, wasps, bees: 6.58%)					
Andrenidae	—	2	2	—	2
Apidae	3	—	—	—	—
Braconidae	—	—	1	—	—
Eupelmidae	—	1	—	—	—
Formicidae	—	—	2	1	—
Halictidae	—	—	2	1	—
Ormyridae	—	—	1	—	—
Pteromalidae	—	—	10	2	—
Torymidae	—	—	1	4	—
Superfamily Cynipoidea	—	—	1	—	—
Hemiptera (bugs, hoppers: 41.86%)					
Achilidae	—	1	—	—	—
Aphididae	—	26	1	23	3
Berytidae	—	—	—	3	—
Cercopidae	—	—	4	—	—
Cicadellidae	1	—	3	139	2
Lygaeidae	—	—	2	7	—
Miridae	—	—	1	—	—
Psyllidae	—	1	—	—	—

(continued)

Table 1 *(Continued)*

Order and Family (or Superfamily)	Bolus 1	2	3	4	5
Reduviidae	—	—	4	—	—
Rhopalidae	—	—	—	1	—
Scutelleridae	—	—	1	—	—
Superfamily Fulgoroidea	—	—	1	—	—
Unknown	—	—	5	—	—
Diptera (flies 21.94%)					
Agromyzidae	—	1	—	—	—
Bibionidae	—	—	10	—	—
Bombyliidae	—	—	—	—	5
Calliphoridae	—	—	1	—	—
Cecidomyiidae	—	1	—	—	—
Chloropidae	—	—	—	1	—
Conopidae	—	—	1	—	—
Empididae	—	—	—	—	5
Muscidae	—	1	2	2	—
Oestridae	—	—	—	—	1
Pipunculidae	—	1	1	—	1
Scenopinidae	—	—	2	—	—
Sciaridae	—	—	—	1	—
Sciomyzidae	—	—	—	—	1
Simuliidae	—	—	—	—	1
Sphaeroceridae	—	—	—	1	—
Stratiomyidae	—	—	3	—	—
Syrphidae	—	—	1	—	3
Tachinidae	—	—	4	—	1
Tephritidae	—	—	1	—	—
Therevidae	—	—	32	—	31
Trixoscelididae	—	—	—	—	1
Section Acalyptratae	—	1	—	—	—
Unknown	—	2	—	—	—
Coleoptera (beetles: 1.28%)					
Elateridae	—	—	1	—	—
Melyridae	—	—	1	—	1
Anobiidae	—	—	2	—	—
Superfamily Curculionoidea	—	—	2	—	—
Psocoptera (bark lice: 27.24%)					
Liposcelidae	—	—	122	22	3
Unknown	—	—	—	—	2
Lepidoptera (butterflies, moths: 0.18%)					
Unknown	—	—	—	—	1
Thysanura (silverfish: 0.18%)					
Lepismatidae	—	—	—	—	1
Araneae (spiders: 0.73%)					
Unknown	—	—	3	—	1
Total	4	38	231	208	66

[a]Values are the number of individuals (by family) for each bolus. The percentage of arthropod orders from the pooled boluses is also given. The orders Hemiptera and Homoptera of Borror et al. (1989) are combined under the Hemiptera.

different families of arthropods were identified from among the 547 prey items contained in the 5 boluses (Table 1). The mean number of individuals per bolus was 109.4 ± 103.1, range 4 to 231. Taxonomic diversity also varied from bolus to bolus. For example, one bolus contained three individuals of the family Apidae (bees) and one member of the family Cicadellidae (leafhoppers), while another contained representatives of 33 families in 6 orders. Two boluses contained many individuals belonging almost entirely to a single taxon (in one case Cicadellidae, in the other Psocoptera). In other boluses these same taxa were represented only minimally (Table 1).

The size of White-throated Swift food items also varied extensively. Mean body length of prey items in millimeters was 3.9 ± 2.0, range 0.7 to 16.7, in the pooled sample of 5 boluses (Figure 1). As expected, some boluses contained fewer large insects, while others had many smaller ones (Table 1). Large, heavy-bodied, or wingless insects were hardly represented, as all prey items were gathered in the air column by flying adult swifts. However, two individuals of the heavy-bodied superfamily Curculionoidea (weevils) were captured, as was one small thysanuran (silverfish), the latter perhaps having been carried aloft by wind currents along with a single ballooning spider. Glick (1939) found thysanurans at altitudes of 330 m, with a single individual captured at over 2500 m. Many other small, weakly flying insects recorded in these boluses may have similarly been passively carried aloft by air currents to the altitudes at which White-throated Swifts typically forage.

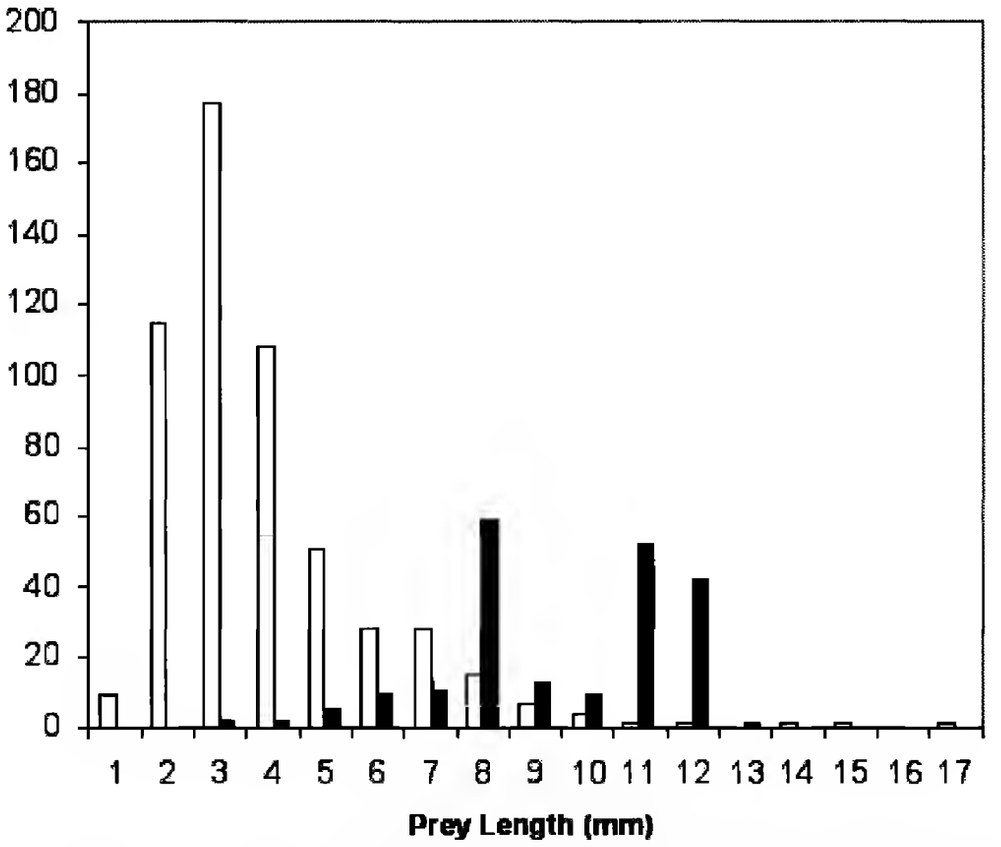

Figure 1. Distribution of arthropod body lengths in combined food boluses of White-throated Swifts (n = 5) and Black Swifts (n = 4), pooled in 1-mm size classes. Size classes contain prey items 0.5 mm greater than and less than the defining length.

The Black Swift samples had a mean number of prey items of 51.5 ± 9.6 and were much less diverse taxonomically than the White-throated Swift boluses: 94% of the prey items were of the family Formicidae (winged reproductive ants), species *Solenopsis xyloni* and *Crematogaster mormonum* (Table 2). Also represented were several hemipterans (bugs, hoppers) and dipterans (flies; Table 2). The mean body length in millimeters of all of the prey items in the pooled sample was 9.5 ± 2.2, range 2.7 to 12.8 (Figure 1).

Previous studies of the White-throated Swift ranked only the relative abundance of insect orders in the diet and did not quantify the numbers of each prey type or provide identification below the level of order (Bent 1940, Hespenheide 1975). The high taxonomic diversity of prey items and extreme variation from bolus to bolus agree with data from previous studies of other swifts (Lack and Owen 1955, Collins 1968, 1980, Bull and Beckwith 1993, Tarburton 1986, 1993). It also suggests that White-throated Swifts, like most swifts in the subfamilies Chaeturinae and Apodinae, are opportunistic foragers, quick to exploit localized abundances of prey, and readily consume any available prey within a preferred size range. Within the Apodinae, White-throated Swifts (body mass 32.1 g; Ryan and Collins 2000) took, on average, larger prey than the smaller Horus Swift (*Apus horus*: 27.9 g; Collins 1980) and smaller prey than the substantially larger Common Swift (*Apus apus*: 42.8 g; Gladwin and Nau 1964) and Alpine Swift (*Apus melba*: 108 g; Cramp 1985).

The Black Swift appears to be a more specialized forager, concentrating on patchily distributed swarms of lipid-rich insects in the form of winged reproductive ants. These swarms emerge every two to four weeks from June through August, typically a few days after rainfall (*Solenopsis* spp., Hooper

Table 2 Arthropod Composition of Four Samples of Black Swift Prey[a]

	Sample			
Order and Family	1	2	3	4
Hymenoptera (ants, wasps, bees: 94.66%)				
Formicidae	51	42	38	64
Hemiptera (bugs, hoppers: 4.37%)				
Cicadellidae	—	—	4	—
Pentatomidae	—	—	1	—
Reduviidae	—	1	—	—
Unknown	3	—	—	—
Diptera (flies: 0.97%)				
Culicidae	—	—	1	—
Chironomidae	—	—	1	—
Total	54	43	45	64

[a]Values are the number of individuals (by family) for each sample. The percentage of arthropod orders from the pooled samples is also given. The orders Hemiptera and Homoptera of Borror et al. (1989) are combined under the Hemiptera.

Table 3 Characteristics of Black Swift Prey Revealed by Four Studies

Mean prey length (mm)	Number of prey items	Range	% Formicidae	Number of samples	Source
9.9, 10.2[a]	289	7.3–12.9	98%	2	Foerster (1987)
7.4	1154	1.8–14.5	91%	10	Marín (1999)
9.5	206	2.7–12.8	94%	4	This study
8.66	276	2.0–12.0	72%	2	Collins and Landy (1968)

[a]Separate means for each of two samples.

1995) The data from this study are in close agreement in both taxonomic distribution and average prey size with previous samples obtained at the Lawlor Falls colony (Table 3) between 1982 and 1985 (Foerster 1987, Marín 1999), as well as with samples from Black Swifts nesting in Veracruz, Mexico (Collins and Landy 1968). These data represent the first case of replicate sampling of the diet of a swift at the same location over a period of many years. Such replication helps avoid misinterpretation due to short-term seasonal or annual variation. Other species of swifts in the Cypseloidinae show a similar tendency to concentrate their foraging on lipid-rich swarming reproductive insects like ants and termites (Collins 1968, Whitacre 1991, Marín and Stiles 1992). They may also adjust their breeding seasons to coincide with the time this resource is maximally available (Marín 1999).

Additional studies of other species of swifts are needed to clarify possible variation in diet by season, from year to year, from location to location, and under varying weather conditions.

ACKNOWLEDGMENTS

We are indebted to the several people, M. Amalong, P. Collins, J. Fitch, S. Langdon, N. Mudry, and T. Ryan, who participated in the banding and collecting of food samples, and to Peter H. Bloom, who first located the Glendale study site and called it to our attention. Roy Snelling of the Natural History Museum of Los Angeles County graciously identified the ant species found in the Black Swift samples. Students of John Rotenberry, University of California, Riverside, provided valuable feedback on the manuscript. Banding activities were conducted under master bird-banding permit 08707 issued to C. T. Collins. Evelyn Bull and Kathy Molina reviewed earlier drafts of the manuscript.

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Accepted 5 February 2004

MOLT, PLUMAGE, BODY MASS, AND MORPHOMETRICS OF A POPULATION OF THE WHITE-THROATED SWIFT IN SOUTHERN CALIFORNIA

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ABSTRACT: Over a 10-year period, I examined molt patterns, plumage, and body-mass changes in a population of White-throated Swifts in the Mecca Hills, Riverside County, California, by sampling birds at regular roosts in each month from February through November. The swifts used the roosts year round but numbers at them declined in March then increased in June and July, after breeding. As a result of plumage wear, the juvenal plumage can be categorized in three "phases": prior to fledging, after fledging, and prior to the first prebasic molt. I found no sexual dimorphism in wingspan, wing length, tarsus length, tail length, culmen length, or body mass. I found an average difference between the sexes in the depth of the tail fork, but because of much overlap it cannot be used to determine the sex of individuals. The maximum difference between highest and lowest body mass was 28.7%, less than reported for other species. Testis size began to increase in March, reaching a peak in April. Primary molt lasted 6–7 months, from May through November. Tail molt lasted about 2.5-3 months, from June through August. Breeding began at this desert site one to two months earlier than at a coastal site. The overlap of breeding and molt in this desert population appears to be less than reported for other species of swifts.

The White-throated Swift (*Aeronautes saxatalis*) is a medium-sized swift widely distributed in North America, from British Columbia, Canada, south through mountainous terrain to Honduras (AOU 1998). It is the most common and only resident swift in southern California (Garrett and Dunn 1981, Unitt 1984).

Despite the species' wide distribution, most of what is known about the White-throated Swift is distribution and taxonomy (Bent 1940, Behle 1973, Navarro et al. 1991, Ryan and Collins 2000), breeding sites (Bradbury 1918, Pitelka 1943, Dobkin et al. 1986), and physiology (Bartholomew et al. 1957). The goal of this study was to describe the patterns of molt and variation in body mass in a single population of White-throated Swifts over an annual cycle.

STUDY AREA AND METHODS

From 1990 through 2000, I collected 112 specimens of the White-throated Swift from a single large roost in Painted Canyon, Riverside Co., California (33° 30′ N, 116° 00′ W; elevation 125 m). The roost was a crack in a large boulder about 15–18 m above the ground and located in a sandy cliff about 60–80 m in height, along a desert wash in the Mecca Hills. I collected a minimum of ten adult specimens per month from February through November. Most specimens were collected within the middle third of each month and are deposited at the Natural History Museum of Los

Angeles County (LACM), Museum of Natural Science, Louisiana State University, Baton Rouge (LSUMZ), and the Western Foundation of Vertebrate Zoology, Camarillo (WFVZ).

Swifts have ten primaries. Molt is generally bilaterally symmetrical, so I scored it for one wing only. The molt score of each primary ranged from 0 to 1: a feather with a score of 0.5 would be about 50% grown, while a feather with a score of 1 would be 100% grown, or new. A bird with all new primaries received a score of 10. Swifts have five pairs of rectrices, and I scored their molt with the same system; thus birds with all new rectrices had a score of 5. The increase in the average molt score by month tracks the progress of the molt. For more details on this method see Stiles and Wolf (1974) and Marin and Stiles (1992). The plumage nomenclature follows Humphrey and Parkes (1959), and color nomenclature follows Smithe (1975, 1981), giving the number and name (e.g., 219 Sepia) of the color of closest match for that plumage. Since I followed no nests at Painted Canyon, I supplemented observations of the plumage sequence with descriptions of chicks ready to fledge at a coastal site in Ventura County.

I measured body mass to the nearest 0.1 g with an Avinet spring balance with a 50-g capacity. I measured wing length (flattened) and tail length to 0.5 mm by using a stopped ruler. I measured wingspan, tarsus, exposed culmen, and tail fork by following the techniques described by Baldwin et al. (1931). To quantify the seasonality of breeding I multiplied the length and width of the larger testis of each male, using this result as an index. Juvenal-plumaged birds were excluded from all morphometric analyses.

RESULTS

Roost Usage and Population Size

The Painted Canyon roost was used year round; judged by the large accumulation of fecal matter at the base of the cliff, it had been in use long before its discovery in 1987. The population varied in number from a low of 25–30 birds in March to more than 400 from July through mid-winter. The most dramatic change in the population size occurred between February and March, when numbers at the roost dropped from about 350 birds to only 25–30. In the latter month local dispersal was obvious, as I found many nest sites elsewhere in the canyon.

Plumage and Age Classes

The juvenal plumage can be subdivided into three "phases" resulting from wear. In the first phase, when nestlings are ready to fledge, both sexes are dark sooty brown (between Dark Brownish Olive 129 and Vandyke Brown 121) and have the primary feathers tipped white with contrasting white edging on both sides of the vane. The forehead is pale sooty-brown (close to Smoke Gray 45), finely edged paler brown, and contrasting with the darker body. The feathers from the upper back to the upper tail coverts and the vent and crissum are finely edged with white. The tertials, particularly the middle ones, are margined with white, as in the adult plumage. Within a month or two after fledging (June–July) the plumage moves into its second phase, in which the fine white edges to the feathers of the back and upper tail coverts

have worn off. The third phase of the juvenal plumage is seen from February through June in the birds' second calendar year. At this time the white edges on the primaries are also gone and the tertials are very worn with some individuals having hardly any white edging remaining. The fine white edges on the feathers of the vent and crissum, however, persist.

The body feathers of the juvenal plumage wear rapidly, and by February they become pale sooty brown (close to Dark Brownish Olive 129) with some areas such as the rump and middle of the back slightly darker. The body color is similar to that of the head. This plumage phase is found just prior to the onset of their first complete molt of primary and body feathers and just before the arrival at the roost of recently fledged birds. The pale body coloration of the juvenal-plumaged birds distinguishes them easily from birds in the definitive adult plumage. Thus, using these plumage characteristics, I could distinguish two age classes throughout the fall (hatching year, HY, and after hatching year, AHY) and the following spring (second year, SY, and older, after second year, ASY). The amount of white on the tertials varies by sex and age class. In general, however, most of the older juvenal-plumaged birds have the tertials more worn than do birds in definitive plumage.

In the first basic plumage the forehead, nape, and body are dark sooty brown (close to Sepia 119) with a slight greenish gloss to the body feathers. The fresh primaries have a narrow white edge along the inner web but lack the well-defined white edge on the tip and outer web of the primaries of juveniles. The fresh feathers of the undertail coverts, particularly the more posterior ones, have a very fine white edging, which wears off quickly. The fresh feathers of the definitive adult plumage are similar to those of the first basic plumage except that the undertail coverts are fully dark sooty brown, lacking white edging. Because of the rapid wear of the fine white edges, the first basic plumage can be distinguished from the definitive adult plumage for only a short period, in August and September.

Primary Feather and Rectrix Molt

Although some swifts in the Mecca Hills initiated their primary molt by late April or early May (by 8 May 1992 growth of the innermost primary was evident), most individuals initiated this molt by late May or early June. By 17 June 1990, all specimens had some growing primaries with molt scores ranging from 0.9 to 2.55. On 26 June 1993 the molt score ranged from 3.25 to 4.3, further suggesting that some individuals started their molt as early as late April. The sequence was centrifugal (from the innermost to the outermost primary) and was usually symmetrical in both wings. During the first half of primary molt up to three feathers could be found molting simultaneously (e.g., two growing and one dropped or three growing at different stages). During the second half, however, usually only one or two primary feathers per wing were molting simultaneously. From May through November the molt progressed steadily, as indicated by the increase in molt score (Figure 1). Some individuals completed their primary molt as early as late September, and by November all specimens had completed their primary molt (Figure 1). Overall for this population, primary molt lasted about 6–7 months, typically from May through November. Although I

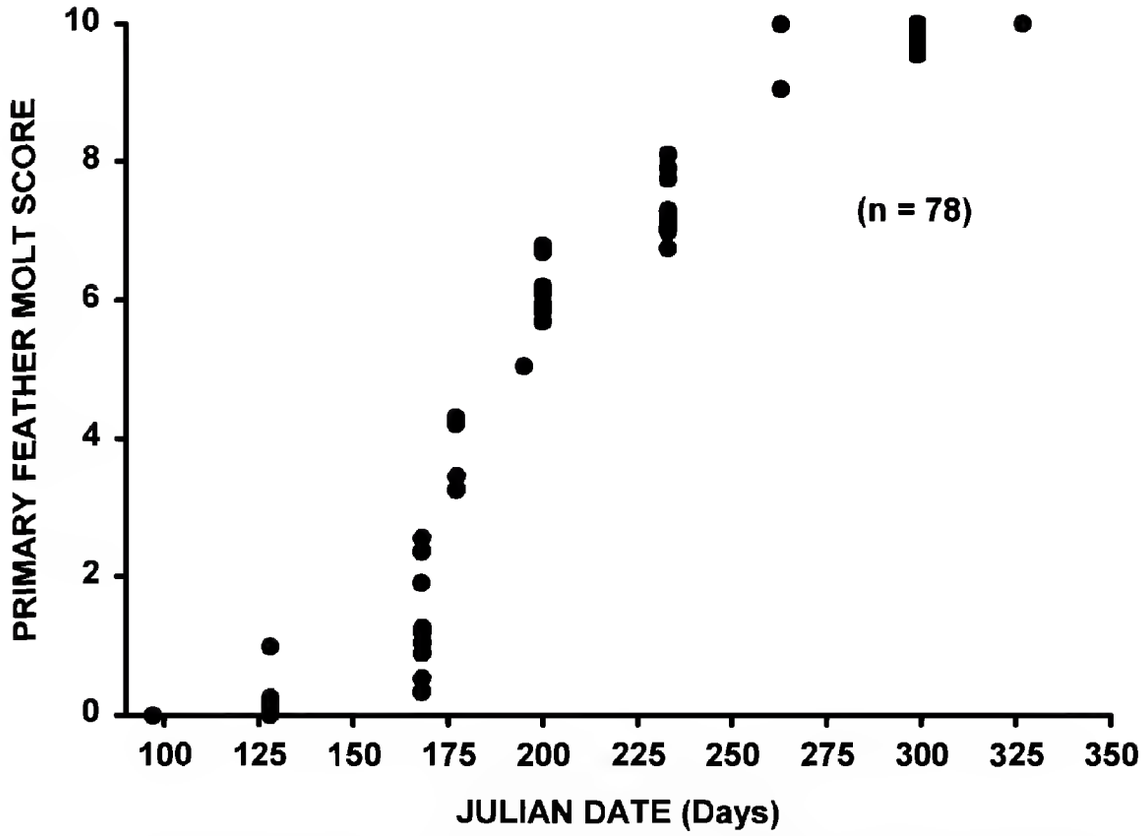

Figure 1. Primary molt score by Julian date in the Painted Canyon population of White-throated Swifts. Julian day 100 = 9 April; day 150 = 29 May; day 200 = 18 July; day 250 = 6 September; day 300 = 26 October. For protocol for determining molt scores, see Methods.

collected these monthly data over 10 years, skipping some months in any given year, the correlation between molt score and date was high ($r^2 = 0.91$, $P < 0.001$), suggesting little year-to-year variation in the molt pattern.

Rectrix molt lasted about 2.5 to 3 months and began about 1 to 1.5 months after the beginning of primary molt. Rectrix molt proceeded centripetally, from the outermost pair to the innermost. As for the primaries, rectrix molt was symmetrical. Usually two pairs of feathers from each side were in molt simultaneously. With the exception of the first (outermost) and last (central) pairs of retrices, each rectrix was molted when the preceding one was almost fully regrown. A few birds began their rectrix molt by late June, but most did so in July. Some finished by August, and all had completed this molt by September (Figure 2).

The molt of the body feathers began by mid August and usually finished by October or November, with some probably continuing into December.

Biometry, Body Mass, and Gonad Size

Depth of the tail fork was the only measured variable in which I found sexual dimorphism. Comparison of wing span, wing length, tail length, tarsus length, exposed culmen, and body mass yielded no significant differences. In males, the depth of tail fork averaged 12.7 mm (range 11–17 mm, $n = 34$), while in females it averaged 10.7 mm (range 5–13 mm, $n =$

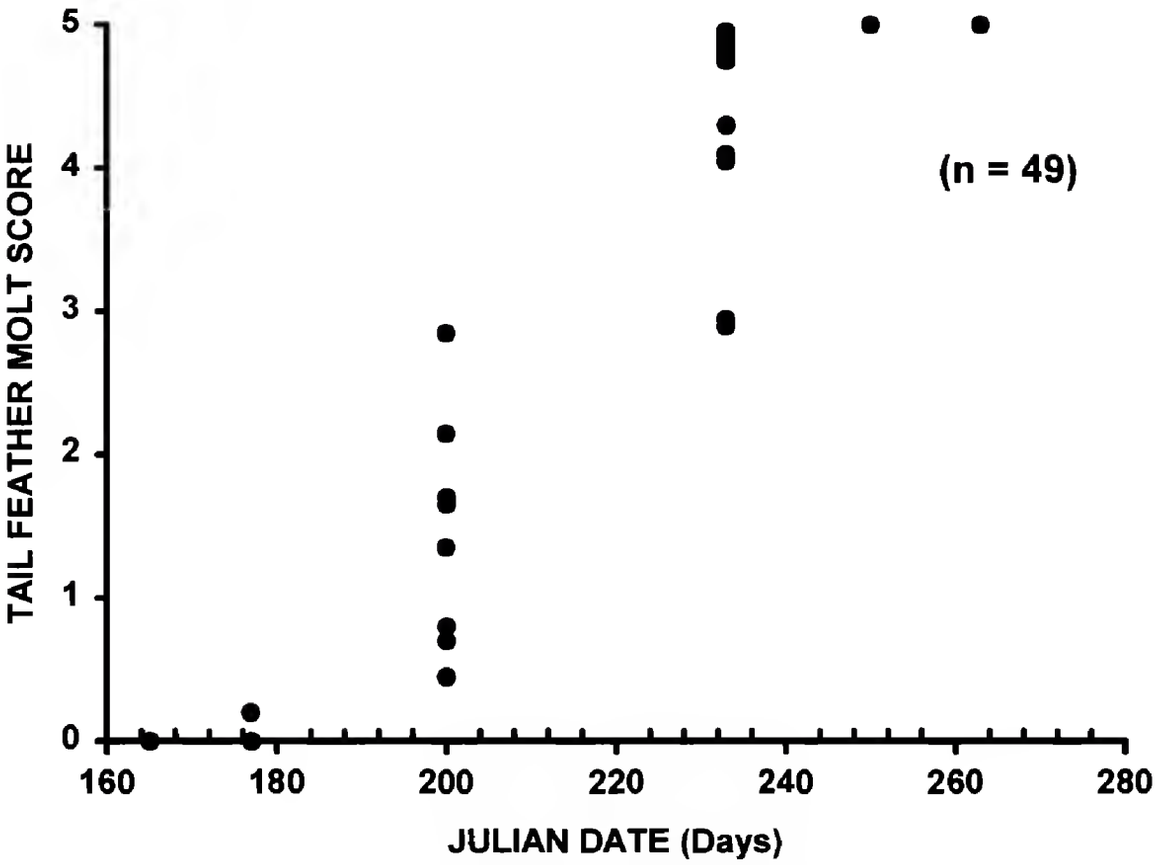

Figure 2. Tail molt score by Julian date in the Painted Canyon population of White-throated Swifts. Julian day 120 = 29 April; day 180 = 28 June; day 220 = 7 August; day 280 = 6 October.

17). This difference was statistically significant (t = 2.80, df = 49, P = 0.007). Measurements of both sexes are summarized in Table 1.

The average body mass by month was similar over the study period. The lowest individual values from June (27.3 g) and July (26.5 g) were only 2–3 g less than minima in all other months (Figure 3). The highest body masses were recorded in April (37.2 g) and October (34.8 g). The overall mean body mass was about the same for males (31.7 g, standard deviation 2.36, n = 51) and females (31.2 g, standard deviation 1.77, n = 32).

Testis size began to increase in March, peaked in April, and declined from May onward. The greatest change occurred between March and April (an increase) and between June and July (a decrease); from July onward testis size was nearly uniform (Figure 4).

White-throated Swifts in the Painted Canyon area appeared to begin breeding in March. On a visit from 17 to 19 March 2000, I found five active nests along the canyon. From the swifts' behavior they probably contained eggs, although I was not able to check nest contents.

DISCUSSION

From February to June, two distinct patterns of plumage wear and color were apparent among the White-throated Swifts in Painted Canyon. The plumage of the birds hatched the previous year was worn and a pale sooty

Table 1 Measurements of White-throated Swifts from Painted Canyon, Riverside County, California[a]

Feature	Mean	SD	Range	*n*
Wing length (mm)	138.1	3.96	127.0–148.0	73
Wing span (mm)	330.1	9.17	310.0–355.0	80
Tarsus length (mm)	11.5	0.57	10.0–12.8	82
Exposed culmen (mm)	5.5	0.32	4.9–6.5	83
Tail length (mm)	55.3	3.61	44.5–64.0	77
Mass (g)	31.7	2.15	26.5–37.2	89

[a]Sexes combined, as they do not differ significantly.

brown; these birds retained some faint white edging on the under-tail coverts. In contrast the plumage color of older birds was dark sooty brown and lacked any white edging on these coverts. It appears that the juvenal plumage wears more rapidly than do post-juvenal plumages.

White-throated Swifts cannot be sexed on basis of plumage color and pattern. While it is possible to identify the sex of some individuals on the basis of length of tail fork, this character should be used with caution, as there is much overlap. Because there is a great deal of variation among both sexes and ages in the amount of white on the longest tertials, with juveniles of both sexes having the extent of white similar to that of adults in definitive plumage, this character can not be used to age or sex White-throated Swifts,

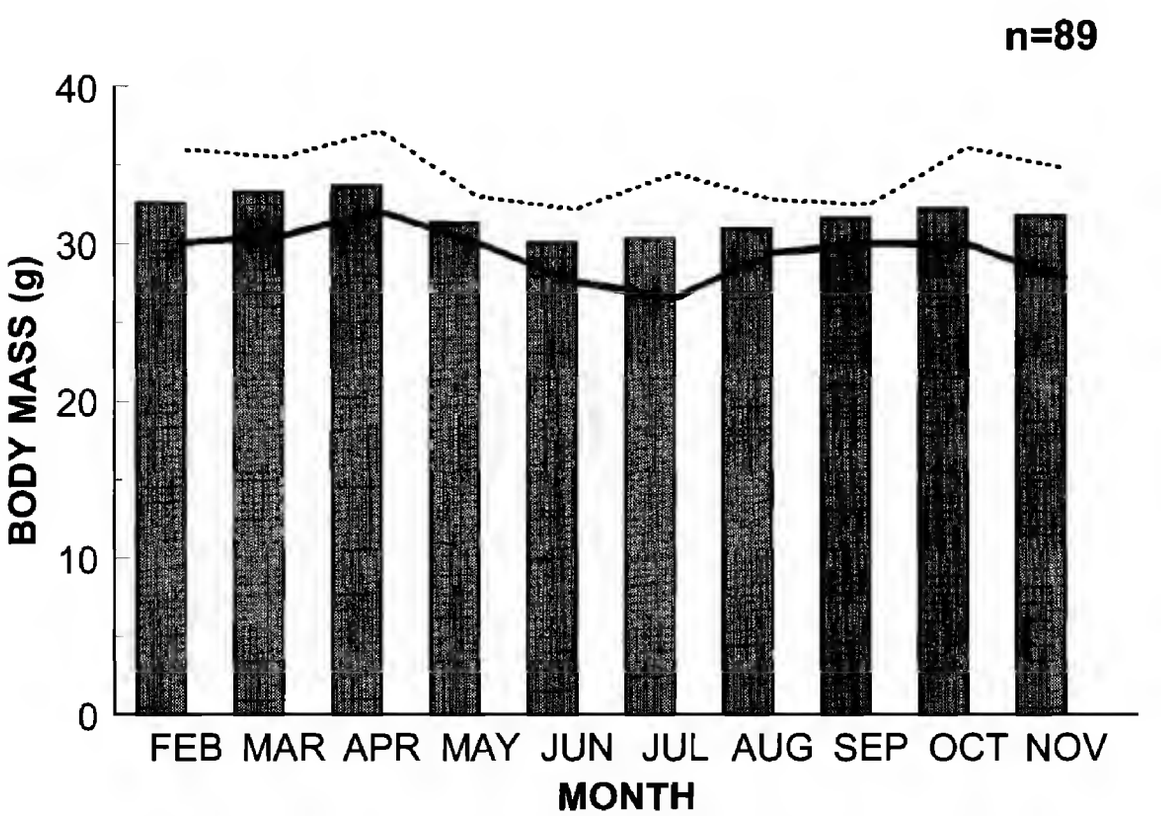

Figure 3. Mean (bars) and range (minimum, solid line; maximum, dotted line) of body mass in grams by month in the Painted Canyon population of White-throated Swifts.

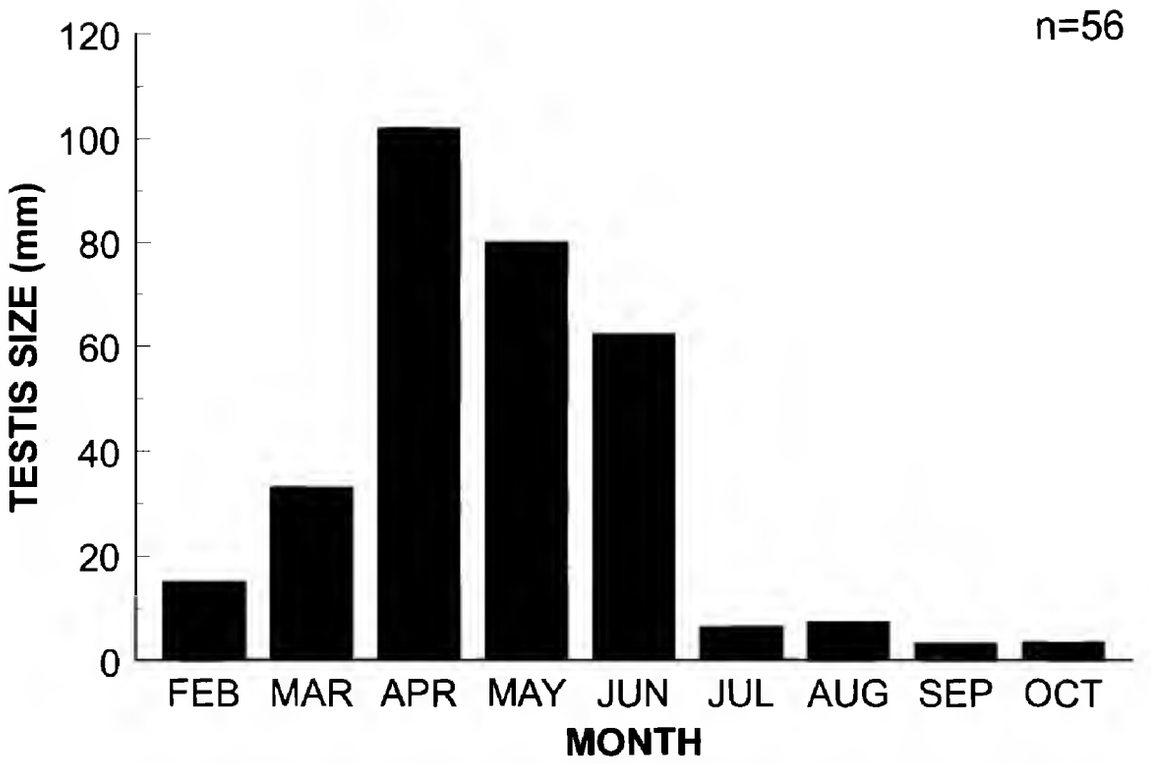

Figure 4. Mean testis size (mm) by month in the Painted Canyon population of White-throated Swifts. No males were captured in November.

as was suggested by Pyle (1997). It is possible to separate juvenal-plumaged birds from those in their first basic and definitive adult plumages through the fall and winter by the presence of white-edged feathers on the vent and crissum. By spring birds in worn juvenal plumage tend to show more wear of the tertials than do adults. This characteristic, when combined with the overall paler color of the worn juvenal feathers, may allow age determination to be made at this time of the year.

Swifts, like many species of birds, molt their flight feathers once a year, taking from between five and seven months to complete this molt. Replacement of the primaries is symmetrical in both wings and sequential from the innermost to the outermost feather (Naik and Shivanarayan 1969a, Zhitong 1982, Marin and Stiles 1992, Bull and Collins 1993, Quang 1994). The Painted Canyon population of White-throated Swifts shows this pattern also. The centripetal tail molt observed in my study population is also similar to that of other swifts (Naik and Shivanarayan 1969b, Bull and Collins 1993). The tail molt, beginning when primaries 4–6 are being replaced, is also similar to the pattern shown by Vaux's Swift (*Chaetura vauxi*; Bull and Collins 1993).

The body mass for both sexes combined (32.1 g; Table 1) is similar to that previously reported from coastal southern California (31.7 g; Dunning 1993). Body mass fluctuates little seasonally (Figure 3) with a maximum difference of 28.7% between the highest and lowest values recorded. This variation in body mass is less than reported for most species of swifts (Naik and Naik 1996). The two most comprehensive studies of body-mass variation in swifts, for the temperate-zone Common Swift (*Apus apus*, Gladwin and Nau 1964) and a subtropical population of the House or Little

Swift (*Apus affinis*, Naik and Naik 1966), showed changes of 79% and 43%, respectively. Both studies concluded that this mass fluctuation is correlated with seasonal variation in weather. The relatively small seasonal variation in body mass I found in this population of the White-throated Swift might be related to Painted Canyon having more uniformly warm daytime temperatures throughout the year.

The White-throated Swift is not colonial per se, although it may nest in loose aggregations depending on nest-site availability. The Painted Canyon roost appeared to be active year round with numbers using the site declining at the time of breeding and gradually increasing again with the arrival of recently fledged birds and postbreeding adults.

In Painted Canyon White-throated Swifts seem to breed one to two months earlier than in parts of coastal southern California. In Ventura County they have fresh eggs from mid May to mid June (WFVZ egg data cards; $n = 60$; pers. obs.) and fledge young from late June to late August (pers. obs.). Thus the breeding and molting schedules of White-throated Swifts vary with local environmental conditions.

Many species of swifts have molt and breeding seasons that overlap broadly (Marin and Stiles 1992, Bull and Collins 1993). The Painted Canyon population of White-throated Swifts does not follow this pattern. The earliest date on which I collected fledglings at the Painted Canyon roost is 16 June. Given that the incubation period lasts about 24 days (H. Richardson in Ryan and Collins 2000) and the nestling period lasts 41–43 days (C. Collins pers. comm.), at least some individuals began laying eggs in early April. Nest building would have begun up to several weeks earlier, and I observed birds at nest sites in Painted Canyon as early as 17 March. In this population some individuals began to molt their primaries in late April and early May, but most did not do so until late May or early June, meaning only partial overlap between the period of incubation and chick rearing and flight-feather molt. Four adult swifts captured while feeding well-grown young near Camarillo, Ventura County, California, in July and August 1999 did not show primary molt, supporting the separation of breeding and molt. In contrast, observations of White-throated Swifts at another site in the coastal zone, in Los Angeles County, showed a broad overlap of breeding and molt (C. T. Collins unpubl. data). Additional study is required to clarify the amount of overlap of breeding and molt periods in this species.

ACKNOWLEDGMENTS

I thank T. Baron, S. W. Cardiff, D. Cepoi, R. Corado, D. Dittman, K. Livingstone, L. Lyon, R. McKernan, J. Schmitt, C. Sumida, W. Wehtje, and K. Whitney for field help. I also thank K. Garrett (LACM), J. V. Remsen, S. Cardiff, and D. Dittmann (LSUMZ). I am grateful to C. Collins, K. Garrett, K. Molina, and P. Pyle for their helpful comments on earlier drafts of the manuscript.

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Accepted 2 January 2004

CHARACTERISTICS OF TREES USED BY NESTING AND ROOSTING VAUX'S SWIFTS IN NORTHWESTERN CALIFORNIA

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ABSTRACT: Given the limited information available on trees used by Vaux's Swifts (*Chaetura vauxi*) in the coast redwood (*Sequoia sempervirens*) zone of California, we gathered information regarding site, tree, and nest characteristics at nest and roost trees that were found opportunistically by various observers. All 14 nest trees and four roost trees were redwoods. Twelve of the nests were found in basal hollows in large live trees [mean diameter at breast height (dbh) 306 cm], one was in a cavity formed at the base of two small live trees (dbh about 50 cm) that had grown together, and one was in a stump (height 1.3 m, dbh 128 cm). Three of the four roost trees were dead with broken tops; their mean height and dbh were 20.0 m and 229 cm, respectively. The fourth was a live tree 33.9 m in height and 297 cm in dbh. These trees were in areas experiencing varying levels of human activity. All nests were located well away from cavity entrances. Our findings suggest that fire plays an important role in the creation of suitable nest and roost trees and that the swifts' tradition of using specific suitable trees lasts for many years.

The Vaux's Swift (*Chaetura vauxi*) occurs as a migrant and summer resident in western North America from southeast Alaska south to central California and east through parts of British Columbia, Idaho, and Montana, nesting exclusively in preexisting natural or man-made cavities (Bull and Collins 1993). Although the swift also uses smokestacks, chimneys, and other structures, typical nest and roost sites are large hollow trees (Bendire 1895, Dawson 1923, Bent 1940, Bull and Collins 1993). With the exception of descriptions of nest and roost trees in grand fir (*Abies grandis*) forests of northeastern Oregon by Bull (1991), Bull and Cooper (1991), and Bull and Collins (1993), quantitative data on nest and roost sites are relatively limited. The majority of California's Vaux's Swift population breeds in the coast redwood (*Sequoia sempervirens*) zone (Sterling and Paton 1996), on the western side of the Coast Ranges from the Oregon border south to Monterey County (Küchler 1977). Because there is little information on the biology of this species in redwood forests, we sought to provide information on nest and roost trees used by Vaux's Swifts in the redwood zone of northwestern California.

METHODS

Between April 2000 and October 2001 we solicited information from birders, foresters, and wildlife biologists on the location of trees used by nesting or roosting Vaux's Swifts throughout northwestern California, since during the course of their activities these observers occasionally discovered trees hosting swifts. We returned to these reported locations to record

detailed data. Although these opportunistic observations of swift trees could be biased toward more conspicuous sites, because existing data are so scanty, we believe the resulting information to be useful to biologists and land managers interested in this species.

We considered the presence of used nests or eggshell fragments, or direct observations of active nests or birds repeatedly carrying food to hidden nests, as evidence of confirmed nesting. We considered trees to be roosting sites when numerous birds were observed simultaneously entering them at dusk or exiting them in the morning. Not all cavities were accessible for examination, and some roost trees may have also functioned as nest trees without our knowledge. Some trees were used for roosting or nesting in the one or two years immediately preceding, but not during, our study period. We included these trees in our dataset because the variables we measured change little over the course of a year or two. At each site we recorded the history of the stand (categorizing it as old growth, second growth, recently harvested, or nonforest), elevation, slope, aspect, and distance to human activity. "Nonforest" areas were forested historically but when we visited them were being maintained as open and generally treeless habitat. We estimated percent total canopy closure at each tree with a spherical densiometer (Lemmon 1956) by averaging four measurements taken at 4.5 m from the tree at each of the cardinal compass directions. For each tree we recorded species, total height, and diameter at breast height (dbh). For cavities with accessible nests, we measured the maximum height of the hollow chamber above the ground, height of the nest above ground, and internal diameter of the hollow chamber at the nest. Height measurements were made with a clinometer or a laser ranging instrument. For each nest we recorded a compass bearing for the cavity entrance and a compass bearing for the nest location within the cavity in order to calculate the angle at which nests were located with respect to the cavity entrance. Following Zar (1974), we then calculated the mean angle between cavity opening and nest location. When possible, we checked trees with active nests the following year to determine if nest trees were reused.

RESULTS

Between August 2000 and October 2001, we located and measured 18 trees that were used by Vaux's Swifts for nesting or roosting in Del Norte, Humboldt, and Mendocino counties. All trees used by swifts were redwoods. Although the redwood was the dominant tree species at all locations, other species such as Douglas fir (*Pseduotsuga menziesii*) and grand fir were also present. The elevation at trees used by swifts ranged from 15 to 549 m [mean 160 m, standard deviation (SD) 154 m, $n = 18$). Eleven of the 18 trees (61%) were on flat ground; this high proportion may have been related to our biased method of finding swift trees rather than any site-selection criteria used by the swifts. Of the 18 trees we examined, 14 (78%) were confirmed as nest sites, either during data collection or in prior years. Of these 14 nest trees, 11 (79%) had nests present and accessible for measurement when we visited them. Two (14%) had nests in prior years but did not contain nests at the time of our visit, and one (7%) had an active nest but the cavity was inaccessible. All accessible

hollow chambers confirmed as nest sites contained only a single nest. Four of the 18 trees (22%) were roost trees.

Nine of the 14 nest trees (64%) were in old-growth stands, three (22%) were in second-growth stands, and two (14%) were in recently harvested areas. Total canopy closure ranged from 6 to 97% (mean 82%, SD 26%, $n = 14$). Five of the nest trees (36%) were within 20 m of trails, roads, or campsites with their potentially high levels of human use and disturbance throughout the swifts' breeding season. Of the seven nest trees (50%) that were active in the first year and rechecked in the second year, five (71%) contained active nests in both years.

Twelve of the 14 nests (86%) were located in basal hollow cavities in old-growth trees. Basal hollows are cavities formed at the base of a redwood bole when fire injury to a live tree allows the entry of fungal rot to the base of the tree bole, which then causes internal decay that is burned out during a subsequent fire. The process is repeated as partial healing occurs around the margins of the cavity, while the inner rotten area expands only to be consumed in each recurring fire (Fritz 1931). This process results in a progressively larger hollow chamber over time; these chambers often extend up into the tree bole well beyond the height of the external entrance to the cavity. Nest trees with basal hollows ranged in height from 49.1 to 96.2 m (mean 69.6 m, SD 21.6 m, $n = 12$). Their dbh ranged from 195 to 510 cm (mean 306 cm, SD 137 cm, $n = 12$). All nests but one were accessible for measurement. The total height of these basal hollows (from the bottom, typically at ground level, to the top of the cavity) ranged from 4.3 to 14.8 m (mean 9.5 m, SD 2.8 m, $n = 11$). Nest height (above the bottom of hollow) ranged from 3.7 to 13.8 m (mean 8.3 m, SD 2.5 m, $n = 11$). All nests in basal hollows were located above the upper end of the cavity's entrance; nest heights averaged 88% of the total height of the cavity. The diameter of the hollow chamber at the nest ranged from 25 to 125 cm (mean 56 cm, SD 32 cm, $n = 11$). Nests in basal hollows tended to be located at right angles from the cavity openings; the mean angle between cavity openings and nests was 93° (mean angular deviation 38.3°, $n = 11$, range 6° to 134°). Six of the 11 nests (55%) were located within 20° of a 90° angle from the cavity opening.

Two of the 14 nests (14%) were found in cavities other than basal hollows, but neither of these structures had nests in them when we collected data. One was in a chamber formed by two second-growth redwoods (dbh of each about 50 cm) that were growing together at their bases and extended up to a height of 3.0 m on both trees. Between these two trees was a cylindrical cavity 1.2 m deep, diameter 42 cm, that extended downward. The swifts entered it from the top. The other nest not in a basal hollow was in a hollow redwood stump, dbh 128 cm, that was partially buried and cleanly cut off at 1.3 m above ground level prior to use by swifts. This stump contained a cylindrical cavity 4.6 m deep, diameter 38 cm, that extended downward. The swifts entered it too from the top. Although this site was not used for nesting during our study, the original observer noted that the nest's previous location was below ground level. Since our study the stump has been used again by nesting swifts. Although both of these nest structures showed some evidence of fire, the role of fire in cavity formation was not clear.

All four roost trees were located in open areas (two were in recently

harvested stands and two were in nonforest areas) with little or no vegetation obstructing the cavity entrances. Two of these were within 50 m of buildings. Of the four roost trees, three (75%) were dead with broken tops, ranging in height from 15.3 to 23.4 m (mean 20.0 m, SD 4.2 m). The dbh for these trees ranged from 173 to 262 cm (mean 229 cm, SD 49 m). Swifts entered each of these trees through a hole at the top. All three were in advanced states of decay, lacked bark and lateral limbs, and showed evidence of past fire. The fourth roost tree, measuring 33.9 m tall and 297 cm in dbh, was green but charred and slowly dying. The entrance to the cavity in this roost tree was a round hole 9.4 m above the ground where a limb had broken off from the bole. We were unable to measure the hollow chambers of roost trees.

DISCUSSION

The nest trees we studied differed from the few that have been described previously from the redwood zone, although many details about the early nests were not provided. Bendire (1895) mentioned a nest site in a burned-out sycamore (*Platanus* sp.) near Santa Cruz, California. All other nest trees previously reported from the redwood region more closely resembled the three dead, top-entry roost trees that we measured. Taylor (1905) described a nest in Humboldt County in a dead hollow "stub" (from his sketch, almost certainly a redwood) that was ≤ 9 m tall, with the nest situated about 0.6 m above the ground. Dawson (1923) discussed and provided photographs of redwood stubs and other dead redwoods in which swifts nested in logged-over areas of Humboldt County. He noted that, regardless of the height of the structure, nests were typically located within about 0.5 m of the ground, with some even below ground level. Bent (1940) provided some details on four nests from Humboldt County that were in redwood stubs ranging in height from 5.5 to 18.3 m; one of these stubs was 3 m in diameter at its base. It is possible that the nest trees discussed by Bent (1940) were some of the same trees discussed by Taylor (1905) and Dawson (1923). These nest trees, like the three dead roost trees we described, are likely the result of intensive logging of old-growth redwood stands, followed by burning.

Bull and Cooper (1991) found the average canopy closure at 20 nest trees in old-growth grand fir forests in northeastern Oregon to be 70.8%. Canopy closure was also high at most of the nest trees we measured, but since two of our active nests were in recently harvested stands, high canopy closure could be correlated simply with the presence of large trees with cavities rather than being an attribute actually favored by Vaux's Swifts.

Flight maneuverability within a cavity may influence cavity suitability and nest placement. In the trees we studied, swifts generally appeared to locate nests as far from the cavity entrance as possible (either above or below), while still allowing some room for flight at the nest. Swifts also appeared to locate nests on either side of the cavity at right angles to the entrance, avoiding the areas directly above or opposite the cavity opening. Thus, while swifts may accept or become habituated to some level of human activity around a tree, within the cavity they apparently seek a secluded location for the nest.

Given the bias in our methods for finding nests, we were unable to estimate the overall proportion of swifts that use old-growth trees for nesting

or roosting, or the overall proportion of nests in basal hollows. However, old-growth trees, especially those containing basal hollows, are likely important to swifts in northwestern California. Because of the role of fire in forming basal hollows, fire in redwood stands is probably an important force creating and maintaining Vaux's Swift nest sites.

Bull and Collins (1996) reported that 70% of nest trees were reused for nesting in subsequent years, a rate similar to that in our limited sample. Repeated use of traditional nest and roost trees would be expected when suitable sites are relatively rare and long-lasting, suggesting that land managers should identify and maintain these important trees. In addition, managers should act to ensure the recruitment of suitable nest and roost trees.

ACKNOWLEDGMENTS

We thank Alan Barron, Mark Bailey, Sal Chinnici, Dan Dill, Lowell Diller, Chris Hayder, Laura Nelson, Chuck Powell, Myrna Rosseau, Bill Stevens, Joel Thompson, Brad Valentine, Tom Wodetski, and Bryan Yost for providing information on trees used by swifts. Amedee Brickey, Susan Neel-Goodsir, Haiganoush Preisler, and Bill Zielinski provided support and assistance. Evelyn Bull, Charles Collins, Jeff Dunk, and Kathy Molina provided useful reviews of an earlier draft.

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Accepted 20 January 2004

DECLINES IN THE BREEDING POPULATION OF VAUX'S SWIFTS IN NORTHEASTERN OREGON

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ABSTRACT: I investigated trends in the breeding population of Vaux's Swift (*Chaetura vauxi*) in northeastern Oregon by revisiting in 2003 39 stands of trees that contained swifts in 1991. In 2003 the number of swifts in these stands was significantly fewer, with only 46% of the stands still containing swifts. Only 29% of the 58 nest and roost trees the swifts were using from 1989 to 1997 were still suitable for nesting in 2003; the remainder had fallen over, broken off, or become riddled with cavities. Factors that may be affecting the population include tree mortality caused by insect outbreaks and disease, tree harvesting, wildfire, climatic shifts, and habitat changes in the winter range.

Vaux's Swift (*Chaetura vauxi*) nests in the Pacific Northwest and winters from central Mexico south to Central America (AOU 1998). On the basis of habitat loss and population decline, in California the species is classified as a species of special concern by the California Department of Fish and Game, in Washington it is classified as vulnerable, but in Oregon its status is secure (NatureServe Explorer 2003). In the forests of Oregon, Vaux's Swifts declined significantly in the 1980s (–8.9% annual change; Sharp unpubl. data). From 1980 to 1999 North American Breeding Bird Survey data imply a rate of decline 4.2% per year over 122 survey routes, with long-term declines in British Columbia, western Washington, and northern California (Sauer et al. 2000).

Vaux's Swifts nest and roost primarily in hollow trees in forests, less commonly in chimneys. Hollow trees of large diameter with decayed heartwood provide the structural components necessary for nesting in forests. In northeastern Oregon, these swifts typically nest and roost in forests with tall and dense canopies. The hollow chambers formed in Grand Firs (*Abies grandis*) by the Indian Paint fungus (*Echinodontium tinctorium*) are most commonly used as nest sites, although the Western Larch (*Larix occidentalis*) and Western Redcedar (*Thuja plicata*) are also used (Bull 2003).

The loss of nesting habitat over the last decade may be partially responsible for the observed declines in Vaux's Swift (Bull 2003). In the 1990s insect outbreaks in northeastern Oregon have killed many Grand Firs, including the large-diameter trees used by swifts for nesting (Bull and Collins 1993). The old multilayered stands that typically contain hollow trees where swifts can nest currently constitute less than 3% of the forested landscapes in the interior Columbia River basin (Hann et al. 1997), and there are few or no alternative stands maturing to replace those which have been lost.

The perceived decline of Vaux's Swift's population size and potential nesting habitat was the impetus behind this study. Its objectives were to determine if Vaux's Swift numbers in northeastern Oregon have declined in the last 12 years and to examine the fate of nest and roost trees used in previous years.

METHODS

Swift Surveys

In June 2003, I repeated surveys of Vaux's Swifts in 39 stands of trees in northeastern Oregon that contained swifts during surveys in 1991 (Bull and Hohmann 1993). These stands are located in the Umatilla and Wallowa–Whitman national forests in Baker, Umatilla, Union, and Wallowa counties. Using methods identical to those of the 1991 surveys, I walked a transect 83.5 m long and 30 m wide (representing an area of 0.25 ha) in each stand while watching and listening for swifts for 20 minutes (Bull and Hohmann 1993). Surveys were conducted between 09:00 and 19:00 during periods of dry weather and at temperatures exceeding 13° C. I recorded the maximum number of swifts seen during each survey period. When swifts were absent from my original stands, and if suitable habitat was present in adjacent stands, I conducted a second survey within 10 km of the former location to determine if swifts had moved to nearby areas. Stands suitable for swifts were those that contained large-diameter Grand Fir trees ≥51 cm diameter at breast height (dbh) that could be used for nesting (Bull and Cooper 1991).

As in 1991, I measured canopy closure and height in each of the 0.25-ha transect areas. I also recorded the number of canopy layers, live and dead trees exceeding a dbh of 51 cm, hollow trees, trees with Indian Paint fungus conks, and potential nest trees. Potential nest trees were those that appeared to be hollow, as indicated by their broken tops, or those that contained one or two Pileated Woodpecker (*Dryocopus pileatus*) roost cavities. I recorded the causes of tree loss since 1991 at the stand level. I compared swift abundance and habitat characteristics between 1991 and 2003 for the 39 stands with paired *t* tests.

Nest and Roost Tree Surveys

Additionally, I revisited 62 trees previously used by swifts for nesting and roosting to record the number of trees that remained suitable for swifts and to examine whether the abundance of potential nest trees had changed in the surrounding 1-ha area plots since 1989–97, when these sites were first located. All nest and roost trees used during the initial survey were in Grand Firs with a mean dbh of 81 cm and height of 24 m (unpubl. data). Original nest trees were considered unsuitable if they were broken off below the entrance hole previously used and no hollow chamber was visible in the portion still standing. Because Vaux's Swifts typically nest in trees with only one or two entrance holes, original nest trees containing more than two additional entrance holes within 5 m of the original entrance hole were also considered unsuitable. Potential nest trees were those that were obviously hollow, as indicated by their broken tops, or contained one or two Pileated Woodpecker cavities.

RESULTS

Swift Surveys

In 2003 I detected significantly fewer swifts (mean 1.0 swifts/transect, SE [standard error] 0.19, range 0–4) than in 1991 (mean 2.3 swifts/transect,

SE 0.17, range 1–5; $t = -5.12$, df = 38, $P < 0.01$). Swifts were detected in 46% of the original 39 stands that contained swifts in 1991 and in 27% of the 15 alternate stands surveyed. Since 1991, large-scale disturbances such as severe defoliation from insect outbreaks ($n = 8$), tree harvesting ($n = 4$), and a wildfire in 1996 ($n = 1$) had occurred in 13 of the original 39 stands, yet in 2003 the swift's abundance in these stands (1.3 ± 0.4 swifts) was not significantly different from that in 1991 (2.1 ± 0.3 swifts; $t = -1.59$, df = 12, $P = 0.14$). In the 26 stands that had no obvious disturbances since 1991, the swift's abundance in 2003 (mean 0.8 swifts/transect, SE 0.21) was significantly less than in 1991 (mean 2.4, SE 0.20; $t = -5.4$, df = 25, $P < 0.01$). In 1991, 85% of the stands with swifts were in old growth while 15% were in harvested stands. In 2003, 91% of the 22 stands with swifts were in old growth, 4.5% were in harvested areas, and 4.5% were in burned areas.

Percent canopy closure was significantly less in 2003 (mean 55%, SE 4.92) than in 1991 (mean 73%, SE 3.99; $t = -3.22$, df = 38, $P = 0.01$). Canopy height was also significantly less in 2003 (mean 24 m, SE 1.92) than in 1991 (mean 34 m, SE 1.44; $t = -5.03$, df = 38, $P < 0.01$). The reductions in canopy closure and height were associated with tree mortality and breakage due to insect infestations. The abundance of hollow trees was significantly greater in 2003 (mean 0.8 trees/transect, SE 0.19) than in 1991 (mean 0.3 trees/transect, SE 0.08; $t = 2.42$, df = 38, $P = 0.02$). This increase was also associated with high tree mortality due to insect infestation. The number of trees with conks of Indian Paint fungus, signaling trees with appropriate conditions of decay and in which nest hollows may form, was significantly less in 2003 (mean 2.6 trees/plot, SE 0.67) than in 1991 (mean 5.4 trees/plot, SE 0.63; $t = -3.72$, df = 38, $P < 0.01$). However, because conks frequently fall off a Grand Fir after the tree dies, this decline may not accurately reflect the number of trees with the decay. Within the 0.25-ha plots sampled I detected no change in the number of canopy layers, live and dead trees of dbh >51 cm, and potential nest trees.

Nest/Roost Tree Surveys

In 2003 I relocated 58 of the 62 swift nest and roost trees found between 1989 and 1997. Seventy-one percent of these trees were no longer suitable as nest or roost sites because they had broken apart and fallen over completely ($n = 40$) or contained numerous cavities of the Pileated Woodpecker ($n = 4$). The remainder of these nest trees (29%) had at least 10 m of apparently hollow trunk still standing. In 2003, only 28% of the original trees remained alive, compared to 68% when the trees were first found. The number of potential nest or roost trees had similarly declined in 71% of the 1-ha plots surrounding the focal nest trees. Tree mortality due to insect outbreaks ($n = 31$), tree harvesting ($n = 10$) and wildfire ($n = 1$) contributed to the observed reduction in the number of potential nest trees. In 29% of these 1-ha plots, the number of potential nest trees remained the same.

DISCUSSION

The results of this study suggest that numbers of Vaux's Swifts breeding in northeastern Oregon have declined since 1991. Furthermore, the lack of

swifts in alternate stands suggests that swifts are not merely moving to other nearby stands but are simply not present in areas they occupied in 1991. Although the number of hollow trees in the 39 surveyed stands increased over time, the number of original and potential nest trees in the survey plots for nest and roost trees declined. Insect outbreaks, tree diseases, and wildfire have reduced the number of nest and roost trees for Vaux's Swifts. The decline of potential nest trees will likely continue as the dead Grand Fir trees fall and as recruitment rates of new nest trees remain low. Changes in numbers of swifts were more pronounced in stands that had not experienced large-scale disturbances affecting forest structure, suggesting other factors may be contributing to the decline. In addition to changes in the availability of nest and roost trees I documented, climatic conditions affecting survival during reproduction or migration, the hazards of roosting in man-made structures along an urbanized migration route, and habitat and climatic shifts in wintering areas may have been contributing factors and require additional investigation. In the eastern United States, the Chimney Swift (*C. pelagica*), a species closely related and ecologically similar to Vaux's Swift, has suffered a similar loss of nesting habitat and decline in population (Clink and Collins 2002).

In northeastern Oregon, Vaux's Swifts readily adopt and breed successfully in nest boxes in forests traditionally used by this species as well as in habitats that currently lack natural nest sites, such as open stands of Ponderosa Pine (*Pinus ponderosa*; Bull 2003). These nest boxes provide alternative nest sites for Vaux's Swifts, and their use in areas where the swift was previously absent supports the conclusion from this study that suitable nest and roost sites may be a factor limiting the swift's population in northeastern Oregon. Additional surveys for Vaux's Swifts in nesting areas and at roosts during migration are needed to determine if the declines in breeding birds observed in northeastern Oregon are part of a more widespread population decline in the species throughout its range.

ACKNOWLEDGMENTS

Janet Hohmann and Barbara Wales assisted with field work. Charles Collins and Georgean and Paul Kyle provided suggestions on study design. Funding was provided by the U.S. Department of Agriculture Forest Service's Pacific Northwest Research Station. Charles Collins and Kathy Molina reviewed an earlier version of the manuscript.

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Accepted 18 February 2004

Vaux's Swift

Sketch by Susan Lindstedt

PURPLE MARTIN POPULATION STATUS, NESTING HABITAT CHARACTERISTICS, AND MANAGEMENT IN SACRAMENTO, CALIFORNIA

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ABSTRACT: The Purple Martin (*Progne subis*) has been eliminated from most of California's Central Valley. The last known population nests in elevated roadways ("bridges") in the city of Sacramento. We reviewed bird records (1949–1990), conducted surveys to assess population size and trend (1991–2002), and evaluated management actions to protect and increase populations. Martins ceased nesting in buildings in Sacramento in the 1960s and 1970s as the European Starling (*Sturnus vulgaris*) population exploded, but adoption of vertical weep holes for nesting beneath bridges in the 1960s has allowed martins to persist. The known Sacramento population increased from four to seven colonies and from approximately 105 to 135 nesting pairs from 1992 to 2002. Martin colonies are located in longer (>85 m) bridge sections that provide at least 6 m of unobstructed airspace beneath the colonies. Management has included a pilot project to insert wire "nest guards" in weep holes to increase survival of young and protecting nesting colonies during construction activities near nests. Initial results indicate that nest guards reduce mortality of young falling from nests and do not result in increased competition for nest sites by starlings and other species. Exclusion of martins from nesting at a large colony to prevent disturbance from a construction project reduced nesting use of the site; such exclusion is not considered necessary to protect nesting birds. Martin recovery may require substantial management, including protecting and enhancing existing colonies, encouraging colonization of other elevated road sites, establishing martin use of artificial nest structures in unoccupied regions, and enlisting public adoption of management responsibility.

The Purple Martin (*Progne subis*) was once considered "fairly common" in California (Grinnell and Miller 1944) but recently has been considered rare to very uncommon in the state (Garrett and Dunn 1981, Zeiner et al. 1990, Williams 1998). The state of California identified the martin as a species of special concern because of a well-documented and drastic population decline and substantial reduction in the species' geographic range (Remsen 1978). A review of the status of the martin in California also confirmed that Sacramento remains the only location in the Central Valley where the species is known to breed (Williams 1998).

The major suggested cause of martin decline in California is competition for nest holes with the nonnative European Starling (*Sturnus vulgaris*) (Remsen 1978, Garrett and Dunn 1981, Williams 1998, 2002). Detrimental effects of starling and House Sparrow (*Passer domesticus*) competition are well documented elsewhere in the U.S. (Brown 1981, 1997) but not specifically in California. Williams (1998) has also suggested that loss of riparian habitat and snags that represented suitable nesting habitat may have

contributed to martin decline in California. Pesticide effects have not been documented but cannot be dismissed.

In the eastern U.S., Purple Martins have relied on birdhouses and gourds as nesting sites for many years (Jackson and Tate 1974, Brown 1997). In the west, Purple Martins have only recently made substantial use of nest boxes in Oregon, Washington, and British Columbia (Copley et al. 1999, Fouts 1996, Horvath 1999). In California, martins formerly nested commonly in buildings but have seldom used nest boxes (Grinnell and Miller 1944, Garrett and Dunn 1981, Williams 1998). In the 1930s and 1940s, use of buildings in cities and towns in California was thought to have increased the state's martin population and range (Willett 1933, Grinnell and Miller 1944). Today, however, no urban areas except Sacramento are known to support nesting martins (Williams 1998).

As summarized by Williams (1998), Purple Martins were reported nesting in trees in Sacramento as early as 1853 (Baird 1858) and were documented nesting in buildings as early as 1924 (Bryant 1924). Nesting in buildings occurred mainly in holes formed by hemicylindrical roof tiles (i.e., Spanish tiles). No recent nests have been reported in buildings in Sacramento (B. and H. Kimball pers. comm.); all recent nesting has occurred in weep holes beneath bridges (including elevated freeways).

We initiated this study in 1991 and 1992 to evaluate the recent historical and current population status and nest site characteristics of the Purple Martin in Sacramento and to assess the effectiveness of management actions for the species. Grantham continued monitoring through 1997 at one site (see Study Area), and Airola reinitiated monitoring in 2002 to assess the population trend. This assessment also incorporates information collected at Sacramento colonies by Williams (1998).

The study's objectives were to:

- identify recent historical and current martin colonies in the Sacramento area.
- evaluate changes in local distribution and habitat use at martin colony locations.
- estimate current populations and recent trends at colonies.
- identify factors that may influence selection of colony sites.
- evaluate effectiveness of recent management actions to protect and enhance martin nesting habitat.
- identify threats to colonies and additional research and management needs.

STUDY AREA

We surveyed for Purple Martins at bridges and buildings in the Sacramento area where they had previously been observed nesting, as well as at other bridges with similar characteristics. All sites used by martins were in bridges built of steel and concrete box girders (Tonias 1995). All these bridges span urban areas and railroad tracks; none crosses water. The bridges support an enclosed chamber beneath the road surface. Weep holes on the underside of the chamber relieve air pressure during heating and

cooling and drain condensation, but they do not drain water from the road surface.

The downtown area contains the greatest number of bridges in the region. We surveyed suitable bridge sections to locate colonies in 1991, 1992, and 2002. Colonies were defined as occupied sites separated by areas of unsuitable or unoccupied habitat that exceed the typical distances between nests within occupied sites.

We studied four occupied colony sites in detail in 1991 and 1992:

- I Street—Interstate 5 at I Street in Old Sacramento.
- 20th Street—U.S. Highway 50 between 19th and 21st streets.
- Broadway—the junction of State Route 99 and U.S. 50, above and adjacent to Broadway.
- 35th Street—U.S. 50 between 34th Street and Stockton Boulevard.

Grantham continued monitoring the 35th Street colony through 1997.

We studied three additional occupied colonies in 2002:

- Sutterville—Sutterville Road overpass of the Union Pacific Railroad (UPRR) yard.
- S Street—Capital City Freeway (Business Route 80) at S Street.
- Roseville Road—I-80 and the adjacent light rail parking-access ramp above Roseville Road and the UPRR tracks.

METHODS

Review of Recent Historical Records

Because available information on the early historical status of the Purple Martin is limited and has been summarized (Williams 1998), we confined the status review to the period since the mid-1900s, for which a substantial number of records were available. We reviewed approximately 970 martin records (1949–1990) from the Sacramento area that Betty and Harold Kimball compiled from their personal field notes, as well as records of other members of the Sacramento Audubon Society (unpubl. data). Other local records from California Department of Fish and Game files were provided by J. Estep and R. Schlorff (pers. comm.).

Many recent historical records noted locations of birds near known nesting colonies but did not confirm breeding activity. We considered breeding at a site to be *possible* if records noted that birds were present during the peak breeding season (mid-April through July) at a specific building or site, *probable* if birds were reported entering holes or carrying nesting material, and *confirmed* if adults were observed carrying food to a nest hole or feeding dependent young, if juveniles were observed within holes, or if recently fledged juveniles were reported near a known site.

We used 1965–1990 records only to document trends in colony locations and nesting habitats. We could not determine abundance and detailed occupation patterns because of limited information on nesting activity. Also, the reported incidental counts of martins are not reliable indicators of colony size (see Results). The first year of site occupation was especially difficult to establish because all potential sites were not surveyed systematically. Site

abandonment dates are more reliable because once the sites were known, observers tended to visit them annually (B. and H. Kimball pers. comm.).

Surveys for Breeding Colonies

We surveyed previously reported martin colonies in 1991, 1992, and 2002. We also surveyed many other sites in Sacramento that could be nesting habitat; these included longer sections of elevated freeway, overpasses with weep holes, and buildings with Spanish tile roofs. We surveyed 25 potential nesting areas from April to July by searching for flying and perched birds. We conducted most surveys before 11:00 or after 17:00 because birds tended to be more active during these periods, especially on hot days (Airola unpubl. data).

Population Estimation at Colonies

Determining population sizes of nesting colonies in bridges is difficult because martins can be counted only as they enter or leave holes or when they are perched or foraging near the colonies. At any time, many birds in a colony cannot be counted because they are inside nest holes, foraging or perching away from colonies, or obstructed from observation by the overhead structure. Also, most chambers within bridges cannot be entered to observe nests. Accordingly, we used two primary approaches to evaluating population sizes: observation of nesting behaviors and hole use, and direct counts.

Evaluation of Nesting Behaviors and Hole Use. With the assistance of a group of trained volunteers, we estimated populations at colonies by observing nesting behavior and mapping bird use of individual weep holes throughout the nesting season. We developed and tested this method in 1991, but because effort and methods were inconsistent that year, we have not reported those results. We prepared maps of available weep holes for each colony site and assigned each hole a unique alphanumeric code. We visited each colony site repeatedly during the nesting season to count birds and map holes entered by martins. During the two years of most thorough surveys (1992 and 2002), we monitored each occupied colony for an average of 8 hours on an average of 13 days at 3- to 9-day intervals (Table 1). We documented more than 2000 individual hole entries by martins annually during 1992 and 2002.

We estimated numbers of nesting pairs on the basis of diagnostic nesting behavior and the frequency of hole use. Diagnostic behaviors that demonstrated nesting use of a weep hole by a pair included adults entering holes with food, adults carrying fecal sacs from holes, vocalizations of begging young, visible presence of young in nest holes, and presence of dead young beneath nest holes.

Diagnostic nesting behaviors were difficult to observe at some sites because of limited access and limited time to observe arrivals at and departures from holes (i.e., birds were often visible for only a few seconds). Accordingly, we also considered holes to be occupied by nesting pairs if adults made repeated visits to specific holes over the course of the nesting period. We considered holes entered two or more times on each of two or

Table 1 Survey Effort Assessing Purple Martin Breeding Populations in Sacramento during Two Years of Comprehensive Surveys

	1992		2002	
Colony	Days	Hours	Days	Hours
I Street	5	3.9	34	20.8
20th Street	17	5.3	12	6.7
Broadway	7	4.7	10	4.4
35th Street	20	15.0	13	12.0
Sutterville[a]	3	1.2	12	4.3
S Street[a]	3	1.3	10	5.0
Roseville Road[b]	0	0.0	4	6.1
Total		31.4		59.3

[a]Unoccupied in 1992.

[b]Not surveyed in 1992.

more days separated by more than one week during the nesting period to be occupied by a nesting pair. In general, the numbers of individual visits and days with visits recorded for most pairs considered to be nesting exceeded this minimum standard. In addition, we combined hole-use counts with less diagnostic behaviors (especially carrying nesting material) to indicate occupancy.

Estimation of populations by behavioral observation and hole mapping is affected by the amount of observation time. Levels of effort at three sites occupied in both 1992 and 2002 were comparable, but we spent substantially more time monitoring the I Street site in 2002 than in 1992 (Table 1). Low survey effort for the S Street and Sutterville sites in 2002 reflected the absence of the species from these sites that year. We have included population data collected by Williams (1998), who used methods generally consistent with ours.

Direct Counts. Because determining population sizes on the basis of nesting behaviors and hole use was so labor intensive, we evaluated the simpler method of directly counting numbers of individuals observed at colonies (direct counts). We evaluated the effectiveness of direct counting as a census technique or population index by comparing direct counts to numbers determined on the basis of behavioral observation and hole-use mapping. Direct counts were made during each visit by repeatedly counting the number of adults observed flying or perching near colonies or known to be in weep holes simultaneously, then recording the highest of these counts for each day. The proportion of the total population at each site observed during direct-count surveys was calculated by dividing the maximum number of birds observed during direct counts over the season by the number of nesting individuals determined to be at colonies on the basis of hole use and nesting behavior.

Habitat Characteristics at Nesting Colonies

Nesting sites and bridge sections not used for nesting were evaluated for a variety of characteristics, including

- length and width of the bridge section.
- height of holes from the ground or other flight obstructions.
- pedestrian activity, lighting, and other human uses (including construction activity).
- availability of nesting material and perch sites.
- relative levels of vehicular traffic beneath sites.
- distance to non-urban foraging areas.

Nestling Mortality

Discovery of dead nestlings below weep holes during population surveys prompted us to investigate the loss of nestlings from nest holes as a mortality source further. On the assumption that young more than 7 days old that were found beneath nest holes had fallen accidentally, we hypothesized the cause to be the lack of any physical barrier at the upper edge of the vertical nest hole. We systematically monitored mortality beneath nests at several colonies where vegetation or debris did not obscure our ability to locate fallen young. We conducted surveys for fallen nestlings every one to three days from mid-June to mid-July, the peak period of susceptibility, and left a sample of dead young in the field to assess losses due to scavenging by predators and pulverization by car tires. We determined ages of young from reference photographs (Rogillio 1992, Hill 1999).

Effectiveness of Nest Guards in Reducing Nestling and Fledgling Mortality

As a pilot project, Grantham devised wire nest guards and installed them in occupied and suitable weep holes at the 35th Street site from 1992 to 1996 (Figure 1). The guards, made of 0.5-inch hardware cloth (wire screen), were designed to provide an internal barrier (i.e., a "fence") to prevent young from falling from nests (see Kostka et al. 2003 for nest-guard design and installation). Effectiveness of nest guards in reducing nestling mortality was evaluated by comparing results of surveys for fallen young before and after installation (1992 and 2002).

Effects of Nest Guards on Roosting by Fledglings

Following fledging, Purple Martin young typically roost at night in the nest cavity for 1 to 12 days (Brown 1997). Because we observed recently fledged young experiencing difficulty reentering weep holes to roost in the evening (see Results), nest guards were also designed to provide a wire ladder to enhance the ability of recent fledglings to reenter holes to roost. We monitored the return of fledglings at the 35th Street site during the post-fledging period in 1992 and 1993 to assess their abilities to enter roost holes with and without nest guards.

Figure 1. Female Purple Martin with food perching at a wire "nest guard" inserted into a weep hole beneath an elevated freeway in Sacramento, California.

Photo by Sacramento Bee/*Chris Crewell*

Competitor Use of Weep Holes with Nest Guards

Weep holes appear to represent the only nesting substrates in the Central Valley where starlings have not been able to displace martins. Because of the concern that the insertion of nest guards could make nest holes more accessible to starlings and other potential competitors, Airola evaluated use by competitors of holes with and without nest guards at the 35th Street site in 2002. Potential effects of wire sleeves on competitive interactions were analyzed by evaluating patterns of use by the species (i.e., use of holes with and without nest guards and changes in holes used over time by martins and competitors).

Locations of Holes Used by Martins and Starlings within Nest Colonies

In 2002, Airola initiated a study of hole-use locations by martins and starlings at the 35th Street colony. He mapped hole use by starlings during martin surveys at this site. Hole locations were characterized by their position (i.e., outermost, next to outermost, or interior) relative to the edge of the bridge. To assess for selection (non-random use) of nesting locations by each species at this colony, the number of holes used in each position was compared against an expected value, based on the proportional availability of holes in each category. Differences were tested for significance by the chi-square goodness-of-fit test (Sokal and Rohlf 1995).

RESULTS

Recent Historical Status

Martins were recorded during the breeding season at 16 sites in Sacramento from 1949 to 1990. Many identified sites supported suitable nesting habitat, but most records consisted of single or several isolated sightings, and breeding was not confirmed during most years (Figure 2). Sites regularly used by martins prior to 1991 were assigned to seven major groups for an assessment of breeding status over the 42-year period (Figure 2). Two groups, downtown buildings and the Capital City Freeway site between L and Q streets, are no longer used, while the other five sites have been used since 1991. Before 1964, all martin observations and nesting records were at buildings in downtown Sacramento. No confirmed nesting at or association with buildings was noted after 1974. Martins were first noted near bridges in 1964, and breeding in bridges (nest building) was first observed in 1967 (Figure 2).

Martin use was reported once historically at both the Sutterville (the site where bridge use was first documented in 1964) and Broadway colonies but then went unreported for extended periods (Figure 2, Table 2). These small colonies may have been overlooked or used intermittently during the intervening years. With the exception of the Capital City Freeway between L and Q streets, the three other freeway sites have been occupied regularly since they were first discovered (Figure 2, Table 2).

Number of Colonies and Population Status

Four bridges supported nesting colonies in 1991 and 1992 (Table 2). Fifteen bridges similar in design and character to occupied sites were not occupied. No martins were found during 1991 and 1992 surveys at nine buildings with tile roofs that the birds had occupied prior to 1972, nor were

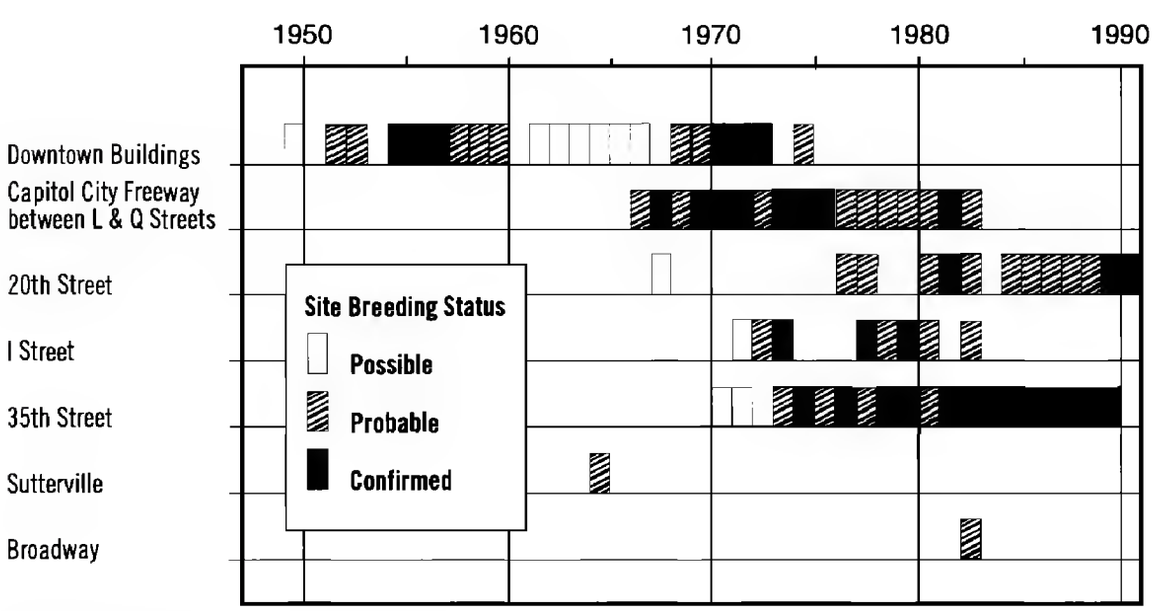

Figure 2. Known occupancy and breeding status of Purple Martin nesting areas in Sacramento, California, 1949–1990.

Table 2 Estimated Breeding Pairs of Purple Martins at Sacramento Colonies 1992–2002[a]

Colony	1992	1993	1994	1995	1996	1997	2002
I Street	23		25	21			37
20th Street	38	48	39	40			14
Broadway	14	10	4	3			8
35th Street	30	34	36	41	34	35	29
Sutterville	0[b]						4
S Street	0[b]						14
Roseville Road							29
Total	105		104	105			135

[a]Surveys conducted in 1992 by Airola and Grantham, 1993–95 by Williams (1998), except by Grantham at 35th Street, 1996–97 by Grantham, and in 2002 by Airola. Lack of a number indicates that no survey was conducted.

[b]Site was surveyed but no martins were found.

they found at other suitable buildings. Also, no martin use of buildings has been observed or reported in subsequent years. Starlings and House Sparrows were observed nesting at many of the former building nest sites.

We found seven active colonies in 2002, including the four sites active 1991–1995 (Table 2). Two other sites (S Street and Sutterville) that were not active in 1991 or 1992 were active in 2002. Roseville Road, which was not surveyed until 2002, was reported occupied as early as 1996 but was not monitored. Distances between nearest colonies averaged 2550 m and ranged from 600 to 9600 m.

We documented diagnostic nesting cues for 62% of pairs that we characterized as nesting in 1992 and for 70% of pairs in 2002; the balance of nesting pairs were so designated on the basis of hole use. In 1992, 105 pairs were estimated nesting at the four colonies (Table 2); three colonies each supported 23–38 pairs, and the Broadway colony supported 14 pairs. From 1993 to 1997, numbers remained stable at most monitored sites and for the population as a whole. They appear to have declined, however, at the Broadway site and increased slightly at the 35th Street site.

In 2002, after a 5-year gap in monitoring, numbers of recorded pairs had increased slightly at 35th Street and substantially at I Street. Numbers decreased substantially at 20th Street following blockage from 2000 to 2002 of 68% of nesting holes used in 1992; this blockage was undertaken to prevent disturbance during construction of a rail line near the colony (G. Moir and J. Mentzer pers. comm.). The two new colonies (Sutterville, not reported used since 1964, and S Street) together supported 18 nesting pairs, and the previously unsurveyed Roseville Road colony supported approximately 29 pairs (Table 2). In total, between 1992 and 2002 (the two years of most consistent and intensive surveys) the known population at all Sacramento colonies increased by 32% (from 105 to 135 pairs).

Despite concerns about overestimation of populations on the basis of counts of nest hole use alone (Williams 1998), we believe that our integrated

approach to assessing numbers of nesting pairs produced reasonable estimates of actual nesting populations for most sites in 1992 and 2002. Moreover, the consistency in effort at most sites provides a reasonably reliable basis for evaluating population trends over this period. Similarity of population sizes at sites during different years (Table 2) suggests that numbers did not fluctuate substantially on an annual basis.

The highest population estimates generated by the direct-count method at three colonies in 1992 represented 12% (I Street), 26% (20th Street), and 28% (Broadway) of the populations estimated by nest-hole mapping at each site. Thus, the direct-count method clearly underestimated populations, and the proportion of the known breeding population counted by this method was inconsistent from site to site.

Habitat Conditions at Nesting and Non-Nesting Areas

Bridges hosting martin colonies had an abundance of weep holes apparently suitable as nest sites. There are more than 1800 holes within 100 m of the seven nesting colonies.

Habitat conditions at occupied sites varied substantially and were similar to those at many unoccupied sites (Airola unpubl. data). On the basis of qualitative evaluation, martins did not appear to select or reject sites because of the width of bridge sections, level of human use beneath sites, presence or absence of lighting, availability of nesting material, or distance to non-urban foraging areas.

Certain minimum conditions, however, were present at all colony sites. Occupied areas were always within a span of bridge at least 85 m long (mean 301 m, standard deviation 184 m). There was at least 6 m of vertical space beneath all occupied bridge sections (mean 8.3 m, standard deviation 1.5 m); martins were absent from all surveyed areas with less space. Martins abandoned one former breeding site (Capital City Freeway between L and Q streets; Figure 2) in the mid-1980s when flight space was reduced to less than 3 m by construction of a two-story parking lot. Also, all occupied sites had unobstructed flight access and low to moderate traffic levels.

Nestling Mortality and Effectiveness of Nest Guards

In 1992, prior to installation of nest guards, we found 32 nestlings that had fallen from nest holes (1.07 per nest) at 35th Street and 12 (0.32 per nest) at 20th Street; in 2002, also prior to nest guard installation, we found three fallen young (0.21 per nest) at S Street In 2002, seven years following installation of nest guards at 35th Street, 23 (79%) of 29 nesting pairs used weep holes with nest guards, and only one dead nestling was found (0.03 per nest). Most nestlings fell from nests 8–14 days after hatching. Scavenging rates of fallen young appeared to be low; all six dead nestlings that we left in place at various colonies were still on the ground during subsequent monitoring periods 7–17 days later. Even young that fell onto active roadways were visible for more than a week; consequently, fallen nestlings did not likely escape detection during surveys.

Fledglings' Use of Weep Holes with Nest Guards for Roosting

On evening returns to the 35th Street colony prior to installation of nest guards, we observed that many fledglings had difficulty reentering the

vertical weep holes to roost. Young birds would misjudge the hole's location and not achieve sufficient vertical velocity to ascend through the hole. Fledglings showed extreme fatigue, which put them at risk of collision with passing vehicles. They eventually gave up and drifted off, apparently to roost outside holes. Some young began roosting in nest boxes that had been erected there. After nest guards were installed, fledglings regularly flew to holes, grasped the wire-mesh liner, and readily climbed into holes.

Competitor Use of Weep Holes with Nest Guards

Monitoring at 35th Street in 2002 showed that no potential nest-hole competitors regularly used holes with nest guards. We observed starlings, the most common competitors, entering 24 weep holes. Nesting behavior was confirmed at 10 holes, and we observed use on multiple days, which we considered to suggest nesting, at four other holes. Only two (8%) of the 24 holes that starlings entered had nest guards, and none of the sites where we observed either breeding behavior or multiple-day use had nest guards. Of the holes where we observed use by White-throated Swifts (*Aeronautes saxatalis*) (5 holes), House Sparrows (2), and Rough-winged Swallows (*Stelgidopteryx serripennis*) (1), none contained nest guards. Some of this difference in use probably reflects both site fidelity by martins and our purposeful installation of nest guards at active martin nest sites.

Use of Hole Locations within Colonies by Martins and Starlings

Starlings selected the outermost holes of the bridge at 35th Street more often than would be expected if selection were random; 13 of 24 (54%) holes used were the outermost holes at the bridge edge, while only 86 (19%) of 444 available holes at 35th Street were at the edge ($\chi^2 = 20.09$, $P < 0.001$, d.f. = 1). Starlings used the next-to-the-outermost holes in proportion to their availability (17% used versus 19% available) and used interior holes at lower than expected levels (7 of 268 interior holes, $\chi^2 = 10.36$, $P < 0.005$, d.f. = 1). Martins did not nest in the outermost holes at this site, but this use pattern did not differ significantly from that expected by chance ($\chi^2 = 2.3$, $P > 0.10$, d.f. = 1). Martins did use outer holes at other colonies.

DISCUSSION

Population Status and Long-Term Trends

The 1949–1990 records indicate that in Sacramento martins nested solely in buildings until they began colonizing bridges in the late 1960s. The effect on the martin population of loss of buildings as an available nesting substrate thus appears to have been offset at least partially by the adoption of bridges. Whether the abandonment of the colony at the Capital City Freeway between L and Q streets (coinciding with construction of a two-story parking lot beneath the freeway that restricted flight space) caused a population decline cannot be determined; individuals could have moved to new sites, or other established colonies may have grown independently.

Comparison of population sizes in 2002 with numbers in previous years shows the population in Sacramento to be stable or possibly increasing.

Most of the apparent increase, however, is attributable to the Roseville Road colony, which was not surveyed prior to 2002, making the determination of an increase uncertain. In the larger context, the Sacramento colonies are remarkable for being one of the largest concentrations of nesting martins in North America that do not rely on nest boxes (Williams 1998). Nonetheless, the Sacramento population is still small and restricted to seven sites that are widely separated from other nesting areas; consequently, it is vulnerable to disruption.

Reasons for Persistence of the Purple Martin in Sacramento

This study helps address the question of why Purple Martin colonies have persisted in the Central Valley only in elevated bridges in Sacramento and why martins have not been reported at bridges elsewhere in the Central Valley.

Nest sites are superabundant in girder and concrete-box bridges, while availability of natural nest sites in riparian habitats has declined with the degradation and loss of riparian and oak woodland habitats in the Central Valley (Katibah 1984). Reduced nest-site availability, however, appears insufficient to explain regional martin decline; martins have used many cavity types (including buildings) that are still readily available but unoccupied throughout a large portion of the species' former range.

Abandonment of colonies in tile roofs in Sacramento was complete by the mid-1970s. This decline, and the adoption of newly constructed elevated freeway bridges, coincided with the period when the starling population in lowland areas of California exploded (DeHaven 1973, Small 1974, Garrett and Dunn 1981, Robbins et al. 1986). This timing suggests that starlings may have excluded martins from tile roofs but could not exclude them from bridges. The abandonment of buildings also coincides with the loss of many colonies in natural habitats as starlings increased (Williams 1998).

The persistence of martins in Sacramento may reflect several interrelated factors. First, nest sites are superabundant in bridges. Second, the vertical weep holes (especially those in the interior portions of bridges) may not be optimal for use by starlings, although starlings regularly nest in weep holes in and near martin colonies in low to moderate numbers. Third, low food abundance in the highly urbanized area of nesting colonies may limit starling populations from reaching levels that would result in nest site competition.

Urban-nesting martins in Sacramento do not appear to be limited by food. Martins frequently foraged directly above urban colonies. During the period of peak food demand for young, martins regularly fed them dragonflies and damselflies (order Odonata), which were superabundant in the immediate vicinity of the nest colonies. The prevailing southerly winds ("Delta breeze") may carry odonates to the colonies from surrounding ricefields, where they reproduce abundantly, or the insects may disperse to urban areas on their own.

The lack of reports of martins at the many other steel and concrete box-girder bridges in the Central Valley and elsewhere in California indicates that use of these structures is rare. If such were not the case, we would expect birders in urban areas to have reported martins in many areas, as they have done in Sacramento. We did not find martins, for example, in an apparently

ideal bridge in Stockton, 50 miles south of Sacramento; moreover, we have seen no martins in many larger bridges throughout the Central Valley that appear suitable.

Outside Sacramento, martins have been reported using elevated highway structures only at bridges on State Route 1 along the California coast (Williams 1998). Martins have also continued nesting in other areas, mostly within forests where lack of foraging opportunities has limited starling populations (Small 1974, Williams 1998).

The current pattern of use of elevated structures may be explained by the coincidence of the construction of suitable bridges with the invasion and subsequent population increase of European Starlings. Martins use bridges in Sacramento, where bridges were available before starling populations exploded, as well as in coastal regions, where starlings have not yet become abundant. Martins are not found where suitable bridges were built subsequent to starling establishment (e.g., Stockton, many Central Valley sites). In these areas, starlings presumably eliminated martin populations in buildings and natural habitats before bridges were available, and no local source population is available now to colonize the new habitat.

Monitoring Methods

Because Sacramento may support as much as a third of the known nesting Purple Martins in California, and because the species' status is so precarious elsewhere in the state (Williams 1998), the Sacramento population warrants consistent monitoring. Development of techniques to monitor martin populations and trends in inaccessible bridge sites, however, is problematic. Numbers observed vary with time of day, temperature, season, and time spent observing. In particular, the direct-count survey method is unreliable in assessing populations or trends; this method not only underestimated populations at bridge colonies but did so inconsistently between sites, despite substantial time spent at sites attempting to obtain the highest possible count. Such results cast doubt on other population estimates derived from direct counts (e.g., historical records in Williams 1998); however, it is likely that the degree of inaccuracy is greater at larger colonies, such as those in Sacramento, than at smaller ones.

Estimating martin populations by evaluating nesting behavior and hole use provides a basis for assessing population trends. However, the potential for inaccuracy stemming from variations in observation time, observer skill, and visibility cannot be fully avoided without access to nest chambers. Accordingly, the population sizes we report should be viewed only as estimates, although they were determined in a consistent manner and are therefore appropriate for assessing population trends.

Assumptions used in population estimation by mapping of hole use (i.e., the accuracy of using a certain number of visits to conclude nesting use) can be evaluated by more intensive study. Where access is possible, direct observation of potential nest sites with cameras or remote viewing equipment (e.g., Kostka et al. 2003) can be used both for monitoring and to test and refine assumptions used in interpreting population estimates derived from mapping hole use and evaluating behavioral cues.

Habitat Characteristics and Protection Needs

The lack of obvious difference between the characteristics of occupied bridge sites and a large number of unoccupied sites, as well as the abundance of unoccupied weep holes within occupied colonies, suggests that availability of nesting habitat is not limiting martin populations in Sacramento. The apparently suitable unoccupied habitat appears capable of supporting a population at least five times larger than currently exists.

Why martins have not occupied the available nesting habitat in Sacramento more fully, even within existing colonies, is perplexing. One possibility is that nestling mortality resulting from falling from weep holes has precluded or dampened any population increase. Moreover, the inability of many fledglings to roost in weep holes without nest guards may have reduced productivity, presumably because excluded young suffer from exposure, injury, predation, or starvation as a result of separation from their parents.

An alternative explanation for the lack of occupancy of apparently suitable habitat is that some important but subtle habitat characteristics may remain undetected. The importance of available perch sites adjacent to nest sites that facilitate nest defense from other pairs is one factor that may warrant further examination and is readily amenable to experimental manipulation.

A third possibility is that unknown factors affecting other California martins may also be affecting the Sacramento population. Starling competition, however, does not appear to be affecting martin populations at Sacramento bridge colonies. Potential population limitations that could be imposed on wintering grounds or migratory habitat remain unexplored, but recent population increases in response to adoption of nest boxes in Oregon, Washington, and British Columbia (Fouts 1996, Copely et al. 1999) suggest that factors on wintering and migratory areas are not significant long-term limiting factors.

Even though an abundance of apparently suitable unoccupied bridges exists in Sacramento, the martins there have strong fidelity to traditional colony sites. Consequently, maintaining the suitability of occupied sites is an important conservation priority. Land uses that reduce vertical airspace beneath colonies to less than 6 m pose the primary threat to current Sacramento martin colonies. Such uses include construction of two-story parking structures and storage buildings, which eliminated the colony in the Capital City Freeway between L and O streets (Figure 2). Construction of buildings and growth of landscape trees immediately adjacent to bridges has also restricted martin access to suitable habitat.

Existing uses protect four colony sites (I Street, Sutterville, 35th Street, and Roseville Road) from land-use changes. Portions of the I Street colony receive heavy pedestrian use, but martins appear unaffected. Sutterville and Roseville Road are in overpasses above railroads. Much of the 35th Street colony is over a Caltrans equipment yard. In contrast, 20th Street, Broadway, and S Street are at least partially above vacant land owned by Caltrans, which is actively soliciting lessees for these sites (L. Vieira pers. comm.). While martins have readily accepted highly urbanized sites and tolerate of many forms of human activity, protection of airspace and access to colonies

in Caltrans leasing decisions is necessary to maintain the long-term occupancy of these existing colonies.

Treatment of Colonies during Construction Projects

The relocation of martins at 20th Street by installing plugs in nest holes from 2000 to 2002 apparently caused a substantial decline in this colony (Table 2). The effects on the entire Sacramento population cannot be determined with certainty, but such exclusion threatens the traditional use of colonies. Because colonies are so few, actions that exclude birds from a large number of occupied nest holes at any given colony, as was done at 20th Street, should be avoided. Since 1991, the area beneath the 20th Street colony has been used during the nesting season to stockpile topsoil and to store trucks and construction materials, but this activity does not appear have to disturbed the breeding birds (Airola pers. obs.). Given the Sacramento martins' past record of tolerance of substantial human activity beneath nest sites, we believe it is unwise to exclude birds from nest sites during construction projects, except where the nesting areas would be affected directly. Scheduling activities from September to mid-March, however, would ensure that disturbance of nesting Purple Martins is avoided.

Nestling Mortality and Effectiveness of Nest Guards

Lack of direct access to nest sites precluded the counting of young at fledgling age and hence the assessment of the nest guards' effectiveness in enhancing colony productivity. The installation of nest guards and their extensive use by martins at 35th Street has not resulted in an increase in the size of that colony, but population size at individual colonies is not a strong indicator of colony productivity because first-year breeders seldom return to their natal colonies (Miller et al. 2001). Many other factors could be influencing the sizes of individual colonies.

Nestling mortality due to falling from weep holes is high enough to be of concern as a factor inhibiting productivity. Reasons for the difference in nestling mortality rates between the two colonies studied (20th Street and 35th Street) are not readily apparent because the bridges are of nearly identical design. Pre- and post-installation data from the pilot study indicate that nest guards are effective in reducing nestling mortality and that martins readily accept nest guards and continue to reuse treated sites for many years after installation. The nest guards do not appear to foster increased competition with starlings or other species; hence, they have not demonstrated any negative consequences. Therefore, we are proceeding, with the help of volunteers, to install additional nest guards at other colonies (Kostka et al. 2003).

Use of Nest Boxes in Management

Managed nest boxes and gourds are the Purple Martin's primary nest sites in the eastern United States (Brown 1997) and the Pacific Northwest (Horvath 1999, S. Kostka pers. comm.). Grantham initiated a program to encourage martins to use nest boxes at the 35th Street site. While some fledged juveniles used boxes for roosting, in subsequent years no adults

nested or roosted in boxes because they were taken over by House Sparrows. While encouraging martins at bridge sites to use nest boxes appears possible, we and other researchers and managers (Kostka et al. 2003) do not consider this a high priority. Developing a box-dependent population requires intensive human management, posing risks for the established colonies. Unless threats to bridge colonies (e.g., incompatible land uses, starling competition) increase substantially, we believe it is better to allow the existing colonies to breed in bridges, with provision of less intrusive management assistance (i.e., installing nest guards, protecting airspace, and avoiding exclusion during construction). A carefully managed program to attract martins to nest boxes, by playing taped dawn songs and mounting decoys (Kostka 2000), might play an important role in restoring martins to former areas of their range and increasing the total population. Success in such a program will depend on developing a dedicated group of professionals and volunteers to implement long-term management.

ACKNOWLEDGMENTS

We wish to thank many collaborators for their assistance. Mark Hada, Mike Rushton, Sam Garcia, and Bud and Margaret Widdowson assisted with population surveys. Stan Kostka provided valuable advice and review. James Hill, III, provided advice on interpreting results. Ted Beedy, Tim Manolis, and Ron LeValley reviewed the manuscript, and Larry Goral edited it. We thank Betty and Harold Kimball for recording and providing their and the Sacramento Audubon Society's 42 years of bird records. Julie Mentzer, Debbie Martin, and Gene Moir provided key information on status and management activities at several colony sites. The California Department of Parks and Recreation, California State Railroad Museum, supported Mark Hada's monitoring efforts. Caltrans provided access to sites and assistance in installing nest guards. The National Audubon Society supported Grantham's efforts. Jones & Stokes provided editorial, graphics, logistical, and financial support.

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Accepted 12 December 2003

BOOK REVIEWS

Raptors of Western North America, by Brian K. Wheeler. 2003. Princeton University Press. 544 pp. Hardback. ISBN 0-691-11599-0.

Raptors of Eastern North America, by Brian K. Wheeler. 2003. Princeton University Press. 440 pp. Hardback. ISBN 0-691-11598-2.

Even in the brave new world of in-depth family monographs, Brian Wheeler's two volumes tread where few have wandered before. North America has long lacked a guide comparable to Dick Forsman's brilliant *The Raptors of Europe and the Middle East*, and Wheeler is the first to attempt to remedy this situation. The result is monumental, staggering in its scope, and, quite frankly, a mixed bag. If nothing else these books break new ground in the world of raptor identification: there are a lot of ideas that go beyond what has been suggested before, many of which need to be tested in the field, some that may become standard in the future, others that will fall by the wayside. In two books with such detail there is a tremendous amount of material to review. And while there are many errors, omissions, or nit-picky details to quibble over, it must be said that this is a highly commendable, deeply personal, and intensely scholarly effort on Wheeler's part—all North American birders and raptor specialists have much to learn from these books.

The layout of these two books is extremely helpful. The introduction, of 30-plus pages, pulls together extensive glossaries of raptor morphology and descriptions of molting patterns and plumage characteristics. Even more fascinating are two introductory chapters that describe types of flying and perching displays, along with photographs of each display. The bulk of the books comprises exhaustive species accounts (33 species in the western guide, 26 species in the eastern) complete with a blizzard of dazzling close-up photographs and the most detailed range maps ever compiled for North American raptors. These accounts cover, in overwhelming detail, descriptions of age, molt, subspecies, color morphs, size, species traits, traits of every conceivable age class, abnormal plumages, habitat, habits, feeding, voice, status and distribution (with subsections on summer, winter, movements, and extralimital occurrences), nesting, conservation, similar species, and other names. If you lose track of the bird at hand in this long listing you're not alone, but there's a wealth of great information here.

Having said all this, I have to ask a question on many people's minds: why two books? Only one species (the Snail Kite) makes it into the eastern guide but not the Western, and huge portions of the text and nearly all the photographs are identical. In fact, it's a tremendous limitation to not have western and eastern range maps side by side, not to mention the sections on status and distribution. It's likely the publisher wanted to generate extra book sales or felt that there was too much material for a single book, but if you look closely you will see excessive repetition that should have been cut in editing. For example, a lengthy treatment of the effects of pesticides is repeated virtually verbatim in the accounts of the Bald Eagle, Osprey, Peregrine Falcon, and possibly other species, rather than being presented once and referenced elsewhere.

Verbiage is definitely a problem in these books. Forsman's book on European raptors elegantly and simply leads readers through each species' distinctive age and sex classes with helpful phrases like "juveniles are easily told by their...," "in flight, upperwings show a diagnostic...," and "adult females can be separated from males by their...." Wheeler, in contrast, approaches each age and sex class with an exhaustive description while scarcely noting those features that distinguish a juvenile from an adult or a male from a female. The descriptions are accurate to the *n*th degree, but the reader probably merely wants to know what key feature(s) to look for. For example, Wheeler describes the "subadult" Bald Eagle for five pages and takes five pages to

describe 27 morphs of the juvenile Red-tailed Hawk. It's a lot of work to pick through this for the information you need.

This problem is particularly acute in the photo captions, where readers can legitimately expect to find the pithiest features highlighted in some hierarchical manner. Instead, each caption merely lists the bird's obvious features, and there is no attempt to rank unique diagnostic features. Thus arise situations like the photos of adult male and female Ferruginous Hawks side by side, both with lengthy (7- and 8-line) descriptive captions. The reader is reduced to scanning the captions line by line while holding a finger or ruler on each line to mark his place, hoping to find a feature that separates the sexes. This frustrating exercise is further necessitated because the massively detailed species account doesn't appear to mention sexual differences even once. Much better would be captions that simply read "adult males are recognized by their characteristic...," etc.

Mention is made above of the category "subadult" used in these books. This is perhaps the most controversial and difficult-to-defend aspect of Wheeler's treatments of plumage sequence. Although Wheeler claims to use the Humphrey–Parkes system of naming plumages, he goes on (p. 23) to say that the term "subadult" is used "synonymously with 'basic' plumage and/or age." But the imprecise term "subadult" was never used in the Humphrey–Parkes system, and its use was also discouraged by William Clark in the September 2003 issue of *Wingspan*, the newsletter of the Raptor Research Foundation. Furthermore, Wheeler's use of "late-stage juvenile" versus "early-stage juvenile" (terms not defined anywhere I found) is ambiguous. In some cases the plumage may be unmolted (western guide plate 19 of the Turkey Vulture), in others a molt is involved (western guide plate 525 of the American Kestrel)—in which case the bird is *not* a juvenile by the Humphrey–Parkes system. Raptor molt is relatively straightforward, but these books lead one to believe otherwise.

The photos deserve special mention because they are the heart and soul of these books. In one word, superb! Never before has there been such a montage of stellar, close-up raptor photos compiled in a single source: Red-tailed Hawks alone are covered in 82 photos depicting more color morphs than you imagined possible. It's tempting to rave about this coverage, but it's equally sober to question how often do we see raptors in such detail? The books would be better suited to field identification if they also included images of distant raptors overhead—as we often see them in the field. And there are curious omissions in the photos: why no adult male Merlin in flight, for instance, why no dorsal view of a juvenile Sharp-shinned Hawk in flight (a very common view at raptor-migration sites)?

Beyond these broad comments, there are countless places for smaller critiques. There are range maps that cut off important geographic regions; for example, the Mississippi Kite map omits California and the 25 or so records at the western edge of this species' wanderings. The status and distribution sections are detailed, but they are unreferenced and so have little if any scientific value; for example, what data were used to map the remarkably detailed breeding ranges shown in Mexico for the Goshawk, Golden Eagle, and Zone-tailed Hawk? There are anomalies in the introductory glossaries (why is BLM defined but not USFS? why is thornbush defined? why define geographic features like "fall line" but not the Great Basin?). Why is the Zone-tailed Hawk not listed as a similar species in the account of the Turkey Vulture?!

Despite some drawbacks, these are still marvelous books that present a range of detail never before attempted in a book on North American raptors. Even top-notch raptor biologists will find many nuggets in the maps, images, and descriptions. Where there are problems, Wheeler merely sets the stage for future study and inquiry, challenging all of us to follow or modify his ideas with our own feedback.

David Lukas

Pipits and Wagtails, by Per Alström and Krister Mild. 2003. Princeton University Press. 496 pages, 30 color plates by Per Alström and Bill Zetterström, numerous maps and sonograms, 240 color photos. Hardback $49.50. ISBN 0-691-08834-9.

This addition to the growing series of identification guides to bird families treats only the 18 species of pipits and 9 of wagtails recognized by the authors as occurring in the Holarctic biogeographic region (ostensibly Eurasia and North America). The title is thus misleading, in that the book does not treat about half of the world's species of the Motacillidae. This approach, however, has advantages over the commoner one of including all of the world's species in a given family, despite an author's lack of familiarity with many species. And the authors of *Pipits and Wagtails* have spent many years studying this group of birds, rather than deciding one day that they'd simply like to write a book. As a consequence, *Pipits and Wagtails* stands virtually alone in this recent series: it is authoritative, well written, and full of literature citations. It should be a model for any future works in this genre.

The introduction includes a discussion of materials and methods, color maps of geographic regions and habitats, and helpful discussions of voice transcriptions and sonograms, age criteria, and taxonomy. Molt terminology is confusing, however, and includes "first adult"—a seemingly redundant term for a first-year plumage indistinguishable from adult plumage. Following the detailed and sometimes thought-provoking introduction come the 30 color plates (18 of pipits, 12 of wagtails); facing-page captions summarize identifying criteria. The meat of the book is the species accounts, which follow the color plates. Species accounts include sections addressing identification, description, geographical variation, measurements, wing formula, systematics, molt, ageing, sexing, voice, behavior, distribution, and habitat. Color maps show breeding and nonbreeding ranges, and numerous sonograms illustrate variation in songs and calls. The book concludes with a section of (almost too small) color photos (annotated with location and date), an appendix listing details of publication date and type locality for all taxa covered, a bibliography, and separate indexes for English and scientific names.

In North America we deal mainly with two species, the American Pipit (called Buff-bellied Pipit in this book) and Sprague's Pipit, but four other pipits and five wagtails have been recorded in North America. *Pipits and Wagtails* provides detailed identification and taxonomic information on all of these species and helps place them in context. For example, Sprague's Pipit is more closely related to the South American pipits than to the holarctic pipits, and the eastern and western groups of the Yellow Wagtail complex appear not to be closely related, despite similarities in their appearance. The authors have combined critical field studies with laboratory and museum work and adopt a "monophyletic species concept," which they explain in the introduction. This approach accommodates a somewhat flexible taxonomic philosophy: e.g., the White Wagtail complex can be viewed as comprising from two to nine species. This said, the authors' own taxonomic interpretations are on the conservative side: they lump the Black-backed Wagtail (*Motacilla lugens* of AOU 1998) with the White Wagtail (*M. alba*), they merge the subspecies *pacificus* of American Pipit into nominate *rubescens*, and they merge subspecies *simillima* of the Yellow Wagtail into *tschutschensis*. The taxonomy discussion ends (p. 38) with a refreshingly honest "contrary to general belief, DNA does not always reveal the truth." And, throughout the species accounts, reference is made to the need for more data to help with many taxonomic questions.

The color plates are clearly and attractively laid out and illustrate most plumages of all species, with a strong emphasis on intraspecific and individual variation. Front and back views of many plumages are shown as well as the more conventional field-guide profiles. Some plates group similar species in comparable plumages, one plate is devoted to 17 heads of males of Yellow Wagtail taxa, and one plate covers 12

plumages of the White (*M. alba ocularis*) and Black-backed Wagtails (but remember to read the text and not look simply at the pictures!). Color reproduction in the plates is generally good, although the Sprague's Pipits are too cold and gray in my copy. An omission from the plates is a female Yellow Wagtail of the Alaskan subspecies *tschutschensis*. Full captions to age, sex, and plumage are given on the plates themselves (a great improvement over simply a bunch of letters, employed by most guides of this genre); letters are also given for quick cross-reference to the facing-page captions. Brief summaries of the geographic range of all species (not just those presumed less familiar to European readers) would be a helpful addition to the facing-page text (these could be lifted from the introductory paragraphs to the species accounts).

Preceding the species accounts are excellent syntheses of pipit (pp. 101–104) and wagtail (pp. 262–266) characteristics and systematics. The species accounts themselves are extremely detailed but clearly organized and well written, although the going gets a little heavy in the accounts of the Yellow Wagtail (46 pages!) and White Wagtail (49 pages!). Each account starts with a brief introductory paragraph that summarizes geographic range, age and sex variation, and number of recognized subspecies. Then follow identification criteria, broken into geographic regions when relevant. This much, in conjunction with the plates, will suffice for most field identifications. The lengthy plumage descriptions that follow, plus information on molt, wing formulae, and 142 tables of measurements and 298 sonograms of songs and calls, epitomize the European penchant for detail. The sonograms often include phonetic "translations" along the top, a helpful touch. There are no sonograms of Alaska Yellow Wagtail songs or calls, and no complete song phrases for the American Pipit—hints at weakness in the treatment of New World taxa. For example, the distribution accounts often simply cite AOU (1998) for summaries of distribution, and much information apparently comes from "Jon Dunn *in litt.*," when it would not have been too difficult to consult, or cite, primary published references. The only recent summary of New World pipit and wagtail taxonomy was not consulted (Phillips 1991); no seasonal pattern is noted for vagrant Red-throated Pipits in California (fall) and Mexico (wintering); the Olive-backed Pipit record for California is overlooked (published in *Western Birds* simultaneously with the included Mexican record); the winter range of Sprague's Pipit shows unexplained allusions of wintering south to Guatemala; the text (p. 183) notes that American Pipits breed in the eastern Aleutians (which is correct; D. Gibson pers. comm.), whereas the map wrongly shows breeding throughout all of the Aleutians. Editing and syntax are generally good (far better than in many books by authors whose first language is English), but slips do occur: note "testicles" (not testes) on p. 15; under the moult section on p. 17, the first use of "pre-breeding" molt should say "post-breeding" molt; figure h on Plate 12 should be labeled juvenile (not adult), as done correctly on the facing-page caption.

The book's stated objectives (p. 14) are to deal with all aspects of identification for all holarctic taxa, and to be a taxonomic review for these same taxa. Notwithstanding some weaknesses in the New World, *Pipits and Wagtails* succeeds admirably in its aims.

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Steve N. G. Howell

FEATURED PHOTO

A VAGRANT BELL'S SPARROW IN BAJA CALIFORNIA SUR

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Although at least seven Sage Sparrow subspecies have been described, the species has generally been regarded as comprising five distinct subspecies (AOU 1957). Nominate *belli* is resident in chaparral from the inner northern Coast Ranges of California south to the coast in Marin County, and south along the coast and foothills through northern Baja California, west of the Sierra Juárez and Sierra San Pedro Mártir, to Santa Catarina Landing at 29° 30′ N. Isolated populations occur in the western Sierra Nevada from El Dorado County south to Mariposa County (Grinnell and Miller 1944). Birds occupying San Clemente Island—the southernmost of California's Channel Islands—have been separated as *A. b. clementeae* on the basis of their average paler plumage and larger bill. *Amphispiza b. cinerea* is resident in the "waist" of the Baja California Peninsula, from 26° 40′ N at Bahía de Ballenas, Baja California Sur, north through the central Vizcaíno Desert to 28° 30′ N at San Javier and along the Pacific coast to Bahía Playa Maria at 28° 54′ N (Grinnell 1928). Although *cinerea* is not known to occur farther north, specimens from Santa Catarina Landing are intermediate between *belli* and *cinerea* and were the basis of the name *A. b. xerophilus* (Huey 1930). In the interior west, *A. b. nevadensis* occupies the Great Basin and Mojave Desert, breeding from central Washington east to extreme southeastern Montana and south to southwestern Colorado and central California. This subspecies is partly migratory and winters from the southern portions of the breeding range south to northern Baja California (generally east of the sierras) as far south as San Andrés at 28° 44′ N (Huey 1931), as well as in northern Sonora and central Chihuahua (Howell and Webb 1995). The population breeding from southwestern Nevada through the Central Valley of California has been separated as *A. b. canescens*, but its winter range is not well-known, as a result of the difficulties of diagnosing this dubious subspecies (Patten and Unitt 2002; see below).

Some recent authors recognize two closely related sibling species within the Sage Sparrow complex: the *belli* group (Bell's Sparrow), including *belli*, *clementeae*, and *cinerea*, and the *nevadensis* group, including *nevadensis* and *canescens* (Rising 1996, Beadle and Rising 2002). The AOU (1998) followed Johnson and Marten (1992), who compared morphometric and genetic variation in samples of *belli*, *canescens*, and *nevadensis*, and concluded that despite the similar appearance and habits of the latter two subspecies, *canescens* is more closely related to *belli* than it is to *nevadensis*. Patten and Unitt (2002) provided a contrary view. They used the Sage Sparrow complex as an example for recommendations on the quantification of the "75% rule" of subspecies diagnosis: "that 75% of a population effectively must lie outside 99% of the range of other populations for a given defining character or set of characters." Working with museum specimens, they assessed the diagnosability of the five subspecies of Sage Sparrow recognized by the AOU (1957), recommending that *canescens* be synonymized with *nevadensis* and *clementeae* be synonymized with *belli*. My discussion below follows Patten and Unitt (2002) in the recognition of just three subspecies, comprising two distinct groups: the coastal Bell's Sparrow group, comprising *A. b. belli* and *A. b. cinerea*, and the interior *A. b. nevadensis* (which includes birds from the range of "*canescens*").

Separation of the three subspecies should be possible in the field given good views. Among those three subspecies, *nevadensis* is the most distinctive, being generally pale gray overall, especially on the back, which contrasts noticeably with the darker

tail. The back is typically well streaked, and the malar stripe is indistinct and grayish, and often incomplete. The breast spot is typically grayish and indistinct, and the breast and flank streaking is typically extensive. Birds occupying the western portion of the range ("*canescens*") average slightly smaller and more well-marked about the face, with the thicker malar stripe and darker back tending towards *belli*. The Bell's Sparrow group differs in its smaller size, generally darker mantle with streaking indistinct or absent, and a more prominent, blackish malar stripe. The tail does not contrast markedly with the back. Rising (1996) and Sibley (2003) suggested that while unworn *nevadensis* has a white outer web to the outer rectrix, *belli* has (at most) buffy edging to this feather. The paler *cinerea* differs from *belli* in its "pale smoke gray or pale buffy ashy gray" upperparts, "narrower, more interrupted, and dull grayish" malar, and "smaller and dusky grayish" central breast spot (Ridgway 1901). Its dark tail does contrast with the paler back. Conventional field guides (e.g., Rising 1996, National Geographic Society 2002, Sibley 2000) depict both *belli* and *nevadensis*, and Beadle and Rising (2002) have color photos of both forms, but to my knowledge there are no published photos or illustrations of *cinerea*.

The featured photos on the back cover show three views of a Bell's Sparrow that Steve N. G. Howell, Richard A. Erickson, and I saw 23 September 2002 at Rancho Santa Mónica, on the Vizcaíno Peninsula, Baja California Sur. Although the images are small, they clearly show a prominent blackish malar stripe, a dark brownish-gray back without prominent streaking, and sparse streaking about the breast and flanks, all of which eliminate the migratory (and thus more likely at this location) *nevadensis*. Resident *cinerea* can safely be eliminated as well, as this individual was quite dark brown on the back and has a distinct breast spot and very distinct malar stripe. The tail does not contrast markedly with the back, eliminating both *nevadensis* and *cinerea*.

Rancho Santa Mónica is located some 250 km south of the nearest known location for *belli*, Santa Catarina Landing, Baja California (about 60 km southeast of El Rosario), and thus this represents the first record for Baja California Sur. Interestingly, although Bell's Sparrow is a bird of dry chaparral, the individual pictured was found in a classic "vagrant trap": a small ranchyard in the desert of the central Vizcaíno Peninsula. The bird frequented a small vegetable garden, overgrown with an abundance of weeds where other sparrows, buntings, and a Lawrence's Goldfinch (*Carduelis lawrencei)* were foraging. Given that the surrounding habitat is desert scrub occupied by resident *cinerea* (though none were found on our visit), it was interesting and significant that the Bell's Sparrow chose this patch of atypical habitat. The Bell's Sparrow was not located during a search on the following day.

The Sage Sparrow (*nevadensis*) is migratory and has occurred as a vagrant as far as southwestern British Columbia, Nebraska, Kansas, Oklahoma (AOU 1998), coastal San Diego County (Unitt 1984), and even Nova Scotia (13 November 1994; Forsythe 1995), but Bell's Sparrow is little known away from breeding areas. Although there are no winter records (Harris 1996), it remains unclear whether the more northerly populations of *belli* in the inner northern Coast Range are resident or engage in some degree of migration or dispersal, as Small (1994) suspected. Bell's Sparrow is essentially unrecorded away from its breeding grounds; I am aware of just eight records away from breeding areas, and all previous records are from areas within 30 km of known breeding sites. Of eight records of the Sage Sparrow from Southeast Farallon Island, just two are documented (P. Pyle pers. comm.): an apparent *nevadensis* described 17 April 1970 and an apparent *belli* described 1 October 1981. One "definite" *belli* wintered at Emeryville Marina, Alameda County, 9 December 1984–29 January 1985, while another at nearby Robert's Landing that same winter was considered only probably *belli* (Am. Birds 39:208). In Monterey County, Roberson (2002) reported that *belli* is "almost entirely sedentary" but mentioned individuals away from breeding sites at Salinas 8 September 1985 and "downstream along the Big Sur River" 14 September 1994. Out-of-place Sage

Sparrows in Santa Barbara County have not been identified to subspecies (Lehman 1994), but, in Orange County, Hamilton and Willick (1996) reported two out-of-range records of *belli* away from breeding habitat: one collected at Seal Beach 5 July 1956 and one at San Joaquin Marsh, Irvine, 28–30 October 1993. The latter record coincided with a large fire in the nearby San Joaquin Hills, where Bell's Sparrow is a very rare breeder. In San Diego County, Unitt (1984) reported that it "seems to be sedentary, but apparently wanders occasionally, since two were seen at Point Loma, a locality where this race does not breed, on 4 and 5 October 1981." To my knowledge these are the only suggestions of movement away from breeding areas, and there are no other reports of this usually sedentary subspecies out of its range. There is a striking coincidence of September and October dates in six out of the eight records of stray *belli*, including the individual in Baja California Sur.

A variety of predominantly foothill and mountain species appeared in out-of-place localities on the Baja California Peninsula during fall 2002, including the Western Scrub-Jay (*Aphelocoma californica*), White-breasted Nuthatch (*Sitta carolinensis*), Western Bluebird (*Sialia mexicana*), Townsend's Solitaire (*Myadestes townsendi*), Spotted Towhee (*Pipilo maculatus*), Fox Sparrow (*Passerella iliaca* ssp.), and Golden-crowned Sparrow (*Zonotrichia atricapilla*). Erickson et al. (2003) drew a connection between these records and severe regional drought in 2001/2002. It is quite likely that our far-flung Bell's Sparrow at Rancho Santa Mónica was part of that same pattern.

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THANKS TO *WESTERN BIRDS*' REVIEWERS AND ASSOCIATE EDITORS

Peer review is a critical step in the publication of a scientific journal. I thank the following people for their generosity in taking the time to provide this essential service sustaining the scientific quality of *Western Birds* for volumes 32 through 34:

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Janet Witzeman

I also thank our associate editors, Daniel D. Gibson, Robert A. Hamilton, Ron LeValley, Tim Manolis, Kathy Molina, and Michael A. Patten, who serve as reviewers themselves. Producing Western Birds is truly a team effort; it could not be done without them. I thank also graphics manager Virginia P. Johnson, photo editor Peter LaTourrette, Featured Photo editor Robert A. Hamilton, book review editor Steve N. G. Howell, typographer Tim Brittain, and printer Barry Blackwood for all working with me as a magnificent team.

Philip Unitt

Western Field Ornithologists announces its 29th Annual Meeting, in conjunction with the annual meetings of the Western Bird Banding Association (WBBA) and Oregon Field Ornithologists (OFO), Hosted by the Klamath Bird Observatory

September 8–12, 2004

The Windmill Inn and Windsor Inn, Ashland, Oregon

The Setting

Oregon's Jackson and Klamath counties offer wonderful opportunities for birders to discover montane and Great Basin species as well as migrants in rural, urban, mountain, and wetland settings. This region is rich in a variety of wildlife, and September will find WFO visiting during the height of southward migration of shorebird and passerines. Field trips to the Cascade Range, the Great Basin Desert, and the creeks, marshes, meadows, and agricultural fields of the Klamath Basin will highlight the rich diversity of landscapes, habitats, and avifauna that southern Oregon has to offer. With sufficient interest, extended post-meeting trips will visit the Klamath Basin refuges, sites in the high desert of the Great Basin, and the Oregon coast.

Conference Activities

The joint annual meeting will offer full-day field trips to the Klamath refuges on September 9 and 12 and local half-day field trips on September 9, 10, and 11. Other planned activities include workshops on digiscoping, sound analysis, and sketching and photography, as well as evening field trips and banding demonstrations. Afternoon science sessions will take place on September 10 and 11, along with a poster session and evening programs with noted speakers. And, of course, we will feature our ever-popular expert slide-identification and sound-identification panels. WBBA will be offering its annual feather workshop during this meeting as well. Social activities will include a welcome reception and a joint annual dinner. As always, WFO welcomes all levels of birders, from beginner to seasoned veteran. Many noted western birders, ornithologists, and professional field-trip leaders are contributing their time and talents to ensure that meeting participants enjoy both great science and great birding.

Call for Papers and Posters

Western Field Ornithologists welcomes scientific papers and posters related to field ornithology from all interested ornithologists, professional and

amateur. Submit abstracts for talks and/or posters to Ted Floyd at tedfloyd@aba.org. Guidelines for talks and posters can be found in the Call for Papers on the Western Field Ornithologists website, www.wfo-cbrc.org.

Registration and General Information

Headquarters for all conference activities will be The Best Western Windsor Inn and Ashland Hills Windmill Inn, both of Ashland, Oregon. These hotels are well located with easy freeway access. Consider bringing the entire family to Ashland for this meeting. For the enjoyment of all, the famous Ashland Shakespeare Festival is a major event that continues into late autumn. There are galleries, museums, and excellent restaurants throughout town, and both hotels have shuttle service to downtown. Conference information, conference schedule, complete hotel reservation information, meeting registration forms, and WFO membership information will be posted at after March 1, 2004. For questions about volunteering to help at the meeting, scholarship sponsorship, or any additional information, contact WFO's one of representatives for the 29th annual meeting, Rob Hewitt of LBJ Enterprises at www.humboldt1.com/~lbjent, 707-442-0339, Catherine Waters at cpannellwaters@yahoo.com, 562-869-6718, or Robbie Fischer at robbie22@pacbell.net.

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September 8–12, 2004

Ashland, Oregon

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Quarterly Journal of Western Field Ornithologists

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Published March 31, 2004 ISSN 0045-3897

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